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Then it's bye, bye blackbird—you'll be happy until October when you'll get another great number of

American Humor

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POPULAR AVIATION

Published Monthly

A magazine for everyone interested in aviation progress and development.

Volume 1 AUGUST, 1927 Number 1

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In the Next Issue of Popular Aviation

Flying for Sport
BY
Erwin Baumgarth
Heath Airplane Co., Chicago

Popularizing Aviation

THIS is a changing world. The toy of yesterday becomes the necessity of today. The miracle of today is the commonplace of tomorrow.

When young Charles Lindbergh sailed over the blue Atlantic as though it were a trip across an inland lake he was more than a courageous, adventuring American boy defying fate and imagination. He became a standard bearer.

A new and more intense civilization is rushing in on the world out of the great unknown. Just as the wildest dream of Jules Verne could not encompass the achievements of the past few decades, so no living man can surely visualize the commanding future!

The entire complexion of civilization is changing.

Aviation will be one of the largest factors in this change.

Transportation of goods and men will be via the air.

It is not too much to predict that within twenty years the developments will be so great as to make the vast automobile industry look like a minor achievement in wealth and power.

Flying craft will dot the air.

The air is free—no rails—no streets.

Men flying several hundred miles per hour will work in the cities and live in the mountains and hills and pleasant places far away.

It sounds weird, but that day is here now. A few more years and it will seem commonplace. Twenty years ago a dangerous experiment—today, a flight from New York to Paris, or Berlin, in less than two days.

To countless thousands of intelligent and able young men of today the business of the air will bring wealth and achievement. The inventor, the explorer, the capitalist, the investor—all will enter into this vast program.

Popular Aviation is issued secure in the knowledge that these things are not a dream.

It means to place in the hands of the young men of the nation the facts of this new great human adventure. Its columns will be easy to read, but authoritative; instructive, but written so that all can understand.

If it will help to speed the great day that is coming and bring incentive to wealth and power to these young men whose will to achieve is ushering in a new era, we will feel that we have also contributed something to the accomplishment.

Lindbergh inspecting his Ryan monoplane, "The Spirit of St. Louis," at Le Bourget, near Paris, the day after his flight.

The Outstanding Feat of the Ages

Any extended story of the record breaking flight of Charles Lindbergh comes, at this time, as anti-climax. Never before has any event been given the newspaper and magazine space accorded this deed. POPULAR AVIATION has, accordingly, merely touched the high places of this adventure so that those who wish to keep their copies of POPULAR AVIATION may have a permanent record of this accomplishment.

ABLASE world has been thrilled. A smug 20th century has been aroused out of its phlegm to pay homage to a 25-year-old flier who spanned the 3,600 miles between New York and Paris in a single hop.

Colonel Charles A. Lindbergh (to give him his present title) took off from San Diego, California, at four o'clock on the morning of May 10, 1927. He was flying his new Ryan monoplane, "The Spirit of St. Louis," provided by the business men of St. Louis, Mo., and in which he had invested his savings. The Ryan plane was engined with a Wright air cooled motor, and was fitted with the best and latest aeronautical instruments, but stripped of all unnecessary weight to provide extra gasoline capacity.

Stopping at St. Louis a day to pay his respects to his backers and for a brief visit to his home town, he left for New York on the morning of May 12, arriving in New York the same day. It seems incidental, in view of his greater triumph, to mention the fact that his transcontinental time of 21 hours and 45 minutes was also a record, being the fastest time in which this continent has been spanned.

In New York three planes were bidding their time in anticipation of flight to Paris. Weather conditions were never quite right, and the flyers waited so that as many factors of safety as possible might favor them. For days the sporting world waited for news of some action. None came. The delay may have taken the flyers off the front pages of the newspapers, but it did not decrease the interest of the great public in the pro-

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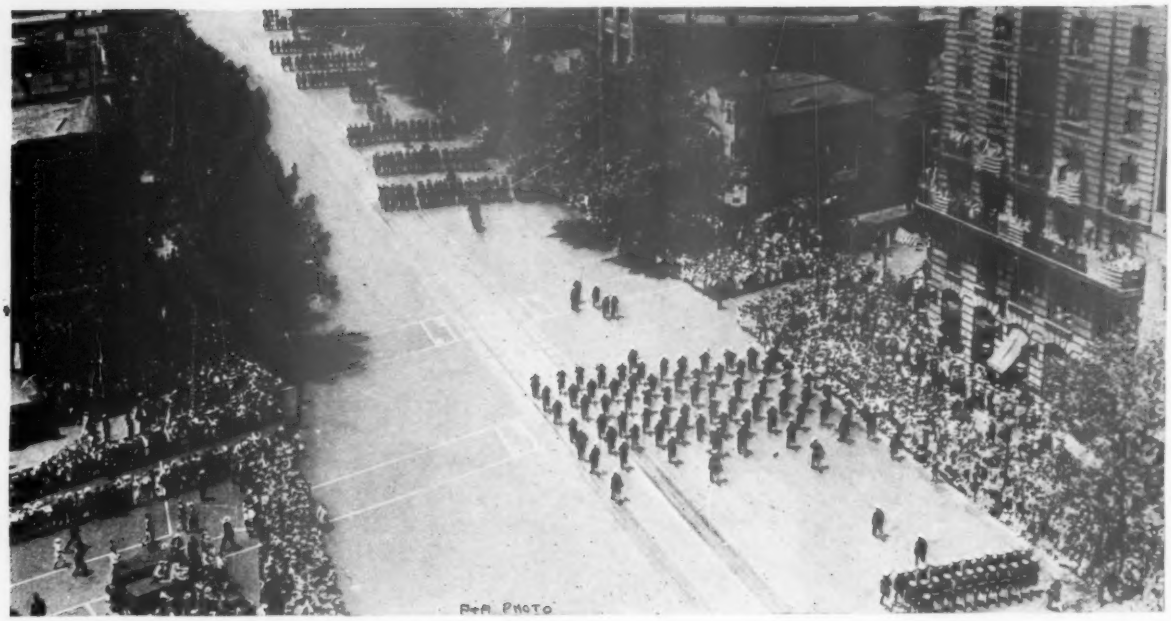


Part of the Lindbergh welcoming parade in New York City.

posed flight. Crowds were in constant attendance at the field.

After days of inaction the country was electrified by the news that Lindbergh, playing a lone hand, had left for Paris. No beating of drums, no crowds of spectators, no cordons of police—just a calm young man off for another flight. At 7:52 in the morning, May 20, 1927, the Spirit of St. Louis left Roosevelt Field.

In order that the layman who has never been in a plane can understand and appreciate the problems which Lindbergh had to confront on his spectacular flight, it might not be amiss to picture the dashboard of the Ryan monoplane. The reader will then realize that Lindbergh had to watch and understand each record given by the instruments. Neglect, a moment's inattention probably spelled Death.

First of all the altimeter, which gives a constant record of the plane's height above sea level. At night this must be watched every moment in case the plane falls imperceptibly and drops into the waves.

The compass, of the earth inductor type, whose needle showed every variation from the line of flight determined upon. This compass is so arranged that a course is set by means of one dial, just as a station is tuned in by the turn of a knob on a radio, while a pointer on another dial shows even the slightest turn to left or right of the set course.

The turn and bank indicator, showing at a glance the position of the plane, with reference to the earth's surface. Without it, at night particularly, or in clouds, an aviator might not be flying horizontally and not know it. The turn and bank indicator and the earth inductor compass are used together in directional flight.

The oil gauge on the dash shows the amount of oil left in the tank, the oil pressure gauge shows that the oil pump is supplying the motor with ample oil, and the oil thermometer showing the temperature of the oil in the motor. Each one of these had to be watched carefully for indications of trouble.

The tachometer records the motor revolutions, a drop indicating trouble. To obviate the most frequent cause of trouble, in the gasoline line, Lindbergh had two gas lines installed, either of which could carry the full load of the motor. In case of trouble with one it could be turned off and the other could be used.

The air speed indicator shows the velocity of the wind. A comparison of the tachometer and the air speed indicator will immediately tell the pilot how fast he is going and how much headway he is losing against the wind.

In addition to these instruments there were the usual ignition switch, carburetor choke and throttle.

Lindbergh made no preparations to take sextant observations, but relied on what navigators call "dead reckoning." This was characterized by Allen Cobham, the English aviator, as a wonderful feat in itself. Lindbergh had carefully checked the accuracy of his new instruments and had made the most careful preparations. As he said before leaving New York, "People forget that I will be able to check my course by the map all the way from New York to Newfoundland. Even at night I could do that, for unless the night is very dark it is possible to distinguish water from land. The most difficult hours of

"The postoffice department has issued a stamp designed for special use with the air mail which bears your name and a representation of the other member of that very limited partnership in which you made your now famous journey across the seas. It is the first time a stamp has been issued in honor of a man still living—a distinction you have worthily won." — Postmaster General Harry S. New to Charles Lindbergh, in presenting the first two Lindbergh air mail stamps to "Lindy" and his mother.

the flight, the first fourteen, will be over land most of the way, and if I can get a good sight of the coast of Newfoundland as I leave it I should be able to tell my drift and get my bearings with some degree of accuracy."

An interested nation listened to radio reports the whole day, and the flight was followed in anxious suspense by hundreds of thousands of people who had never heard this young man's name before that day.

After taking off, Lindbergh was soon out of sight of land. From Cape Cod to Nova Scotia the route lay over open sea. The motor performed to perfection, and the plane carried the load of 451 gallons of gasoline and 20 gallons of oil. This fuel gave the ship the greatest cruising radius of any plane of its type.

At St. John's our flyer went out of his way a few miles to check on his course and flew low so that his location could be definitely established. St. John's was his last sight of land before taking to the open sea.

In spite of the fact that he was enclosed in his plane and required a periscope in order to see straight ahead, Lindbergh had sufficient view through the side windows to navigate with ease.

After leaving Newfoundland he began to see icebergs through the low fog. He struck clouds and ascended to an altitude of 10,000 feet and remained at that height until early morning. In his own words, "it was like driving an auto over a smooth road, only it was easier."

The news of Lindbergh's flight caused the newspapers of the United States to use 25,000 tons more paper than usual, at a cost of approximately $1,500,000. No estimate has been made on the cost of the paper torn up and scattered from the buildings in cities where Lindbergh showed himself. The telephone company can concern itself with that figure, as it lost thousands of directories.

As the morning light became somewhat stronger the clouds increased and he was forced to fly under some and over others. Sleet in all of these clouds began to cling to the plane. Sleet is the bane of the aviator, as it adds to weight and cuts down the efficiency of the plane's lifting surfaces. There was no remedy for the situation, so he continued on his way to Ireland.

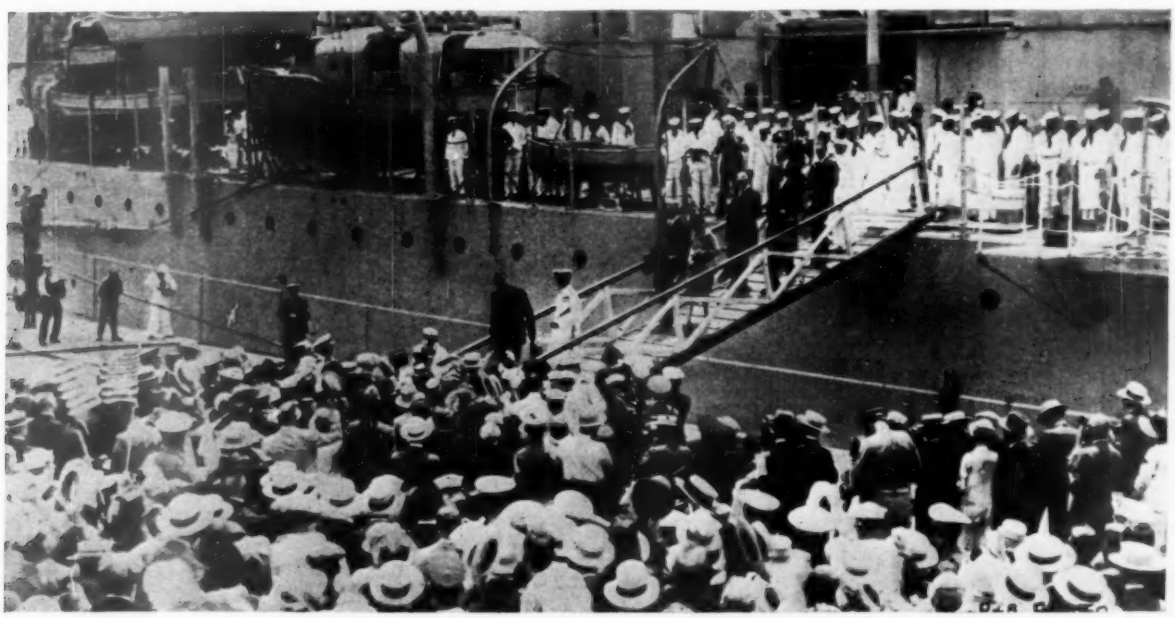
Early in the afternoon he sighted a fishing fleet and knew that he was not far from the coast. An hour later he sighted land, shortly before 4 o'clock, a point on the Irish coast, as he afterward discovered, only three miles from the theoretic point chosen. This in itself is a remarkable proof of his navigating abilities.

Flying low over Ireland, he crossed to England, also flying low, crossed the English Channel at a greater elevation and passed somewhat west of Cherbourg.

With victory in his grasp, he followed the Seine until Paris, with the brilliantly lighted Eiffel Tower, lay under him. When only a half hour from Paris rockets and Very lights were sent up from the flying field, and he had an inkling of the attention he was attracting. He circled Paris once and flew over LeBourget flying field, but, mistaking its direction from Paris, he again flew back to the city, looking for another air field. Not finding one, he knew that he had been right the first time and returned to LeBourget, where he stepped into one of the most uproarious and crushing celebrations that the French capital had ever seen.

He was all but overwhelmed by a sea of humanity that swept into the field to greet him and see the victorious plane. Only the prompt action of the airport authorities, aided by platoons of gendarmes, prevented the Spirit of St. Louis from being torn to pieces by souvenir hunters.

His first words on landing were typical of the modesty of this youth who has captured the hearts of not only his countrymen but of all the foreign na-



Lindbergh leaving the Cruiser Memphis, followed by his mother and the President's representative.

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tions who have seen him. No blatant boasting of his deed, no facetious statement of triumph, nothing but a mere statement of identification—"I am Charles Lindbergh."

With a foretaste of celebrations that were to accompany him for weeks, he was brought to the United States Embassy as a guest of Ambassador Herrick, who hailed him as a flying ambassador of good will for the United States.

The cheers and adulation which he received in Paris, and subsequently in Brussels and London, are old stories by now. It is sufficient to say that the welcome given him and the encomiums bestowed upon him were induced as much by his own conduct as by his feat.

To make the New York to Paris flight alone required daring and knowledge. To win the love of a nation, depressed by the tragic failure of one of their own admired flyers to accomplish the same deed, required something more —diplomacy.

A Washington statesman said that a better emissary could not have been chosen for the purpose of sustaining friendly relations had a deliberate search been made. His modesty and simplicity, entire absence of vain-glory, and the little sentimental touches, which the French love, were all there. The visit to Nungesser's mother, visits to memorials dear to the French heart, attendance at benefits—all these were the acts of an unspoiled hero.

The heads of three governments bestowed decorations on this youth and he was showered with offers aggregating millions of dollars. These did not turn his head. Declining to consider offers unrelated to the business of aviation and wisely seeing that time would not permit him to visit every European capital, he prepared to cut his visit short.

A message from President Coolidge, through a cabinet committee, asked the flying hero to be the guest of the nation at the capital immediately on his return, and placed at his disposal the cruiser Memphis, the flagship of the American fleet then in European waters.

Leaving his European admirers behind, and disappointing thousands who had hoped to see him, Lindberg sailed for the United States on the Memphis. He was met near Cape Henry by an escort of destroyers and planes. On landing he was first met by his mother, the quiet teacher of chemistry in a Detroit school, so envied by hundreds of thousands of mothers.

Stepping into a plane, he was piloted to Washington, where he was received by the official committee and decorated by the President. Thousands of people poured into Washington June 11 to get a sight of this man.

Here he received the honors he had been awarded and made the brief speeches which are so characteristic of him. Function after function were attended by "Lindy" and his mother, who were the guests of the President at the temporary White House.

His later reception in New York eclipsed anything the city had ever staged. Somewhat tired, but unbewildered by the constant crowds and the prearranged programs, Lindbergh is sacrificing his privacy for the benefit of those whose wish is to see him and, if possible, speak to him. For days, and probably weeks to come, he will be unable to go about the ordinary affairs of life without attracting the attention given to those in the popular eye.

Tons of newspaper clippings, a half million pieces of mail, thousands of telegrams, uncounted gifts, still await the attention of this American, who by a single act of courage and skill drew to himself the loving admiration of many nations.

Lindbergh's welcome in St. Louis and his efforts to catch up with the enormous mail awaiting him were interrupted by a call from Washington. Government officials of the Air Corps, Navy Department and the Bureau of Aeronautics asked his presence for a series of conferences.

To date no indication has come from the Colonel as to what his future plans are to be, except that he has steadily maintained that whatever he does will be connected with aviation. Offers from the vaudeville circuits and the motion pictures apparently do not interest him.

It has been announced by the Guggenheim Foundation that Lindbergh will first make an air tour of the country in the Spirit of St. Louis for the purpose of promoting interest in aviation.

Lindbergh and Bleriot. The trophy is the one Bleriot received for his Channel flight in July, 1909.

The Record Flight

Left San Diego at 3:55 p. m. May 10.

Arrived St. Louis in 14 hours and 25 minutes. Distance: 1,600 miles.

Left St. Louis at 8:13 a. m. May 12.

Arrived New York in 7 hours and 20 mintes. Distance: 900 miles.

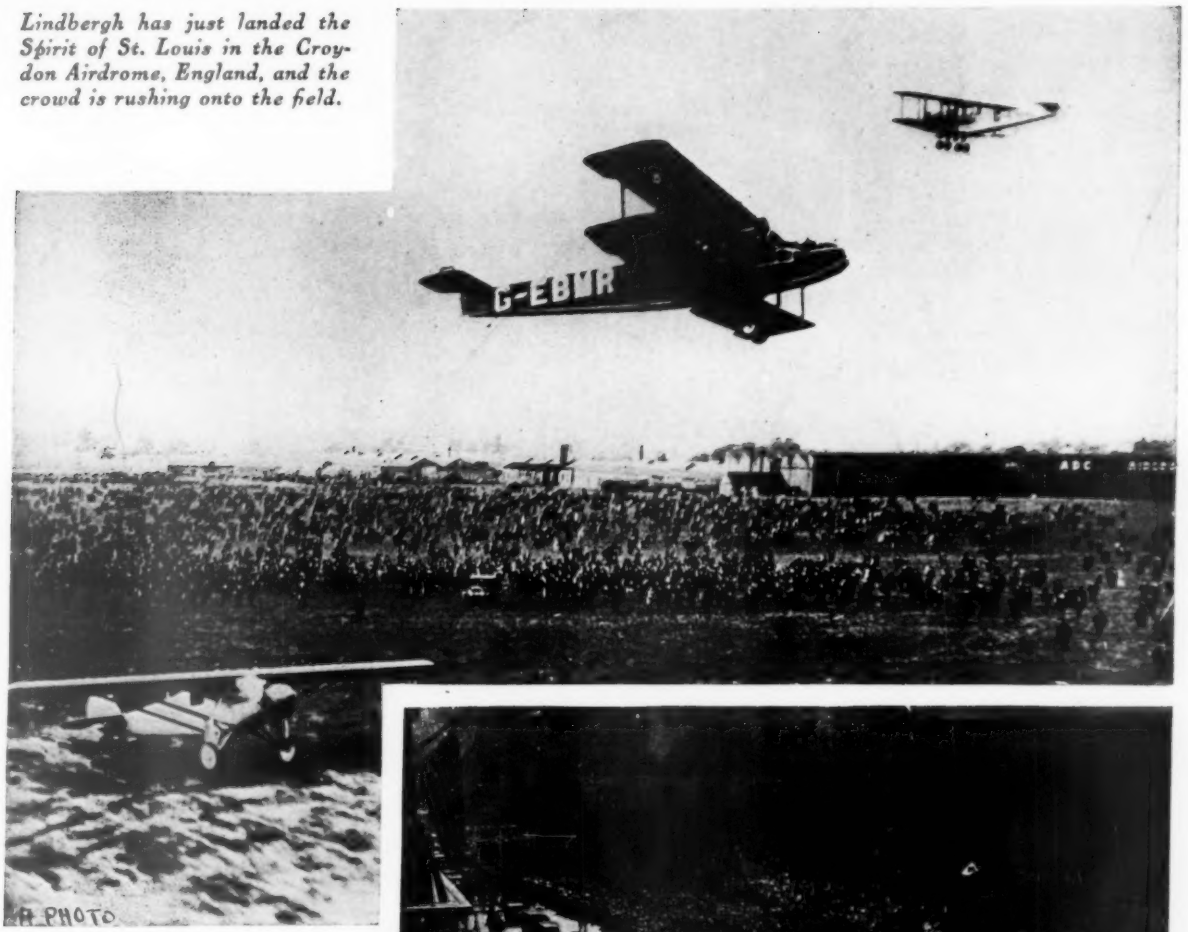
—

Left New York at 7:52 a. m. May 20.

Arrived in Paris at 10:21 p. m. May 21. (Paris time is 5:21 p. m. New York time.)

"Lindy" making one of his short speeches at the Brussels airdrome.

Lindbergh has just landed the Spirit of St. Louis in the Croydon Airdrome, England, and the crowd is rushing onto the field.



High Priced Welcome

Two moving picture men were talking over the New York welcome to Lindbergh and estimated that to reproduce the sight in the movies would cost somewhere in the neighborhood of $50,000,000.

"We have been putting on gigantic spectacles for years, but have never put over anything like that show of New York for Lindy." One of the men figured that scenery alone would cost about a quarter of a million per block, with the hiring of thousands of extras, planes, police, ships and the like to be added to say nothing of paper to throw out of windows.

Such masses of people have seldom been cramped and crowded into the streets as in the welcome New York extended to Colonel Lindbergh.

The Columbia as it appeared one hour after leaving Roosevelt Field, Long Island.

The Second Great Hop

Nothing can deprive these two courageous men of the well-deserved praise they have earned for their daring flight to Europe. Careful planning and cool execution brought success.

FACING the criticisms and jibes of millions should they turn back, and something of an "after thought" in welcomes if they proceeded—with death always the price of failure—Clarence D. Chamberlin, pilot, and Charles A. Levine, his financial backer, took off from Roosevelt Field, New York, June 4, at 6:05 a. m., for a "destination unknown."

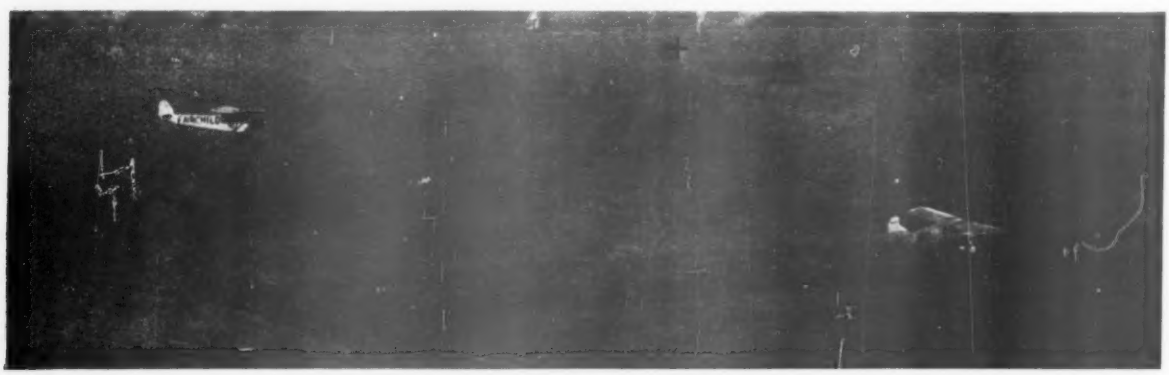
Flying a Bellanca monoplane, powered with a Wright Whirlwind motor, Chamberlin set out to demonstrate that a transoceanic flight was not an isolated occurrence and that planes were being built that could make the trip in a continuous flight. The "Columbia" was the same plane with which Chamberlin, accompanied by Bert Acosta, had broken the world's endurance record a short time previously.

Relying on the careful estimates of the designer, Giuseppe M. Bellanca, who had calculated the gas consumption and capacity for the endurance flight so accurately, Chamberlin felt that he had more than sufficient fuel to take him to the mainland of Europe, and that favorable flight conditions over the Atlantic might add hundreds of miles to the possible mileage of the plane and enable him to land at some distant European capital.

At the last minute no announcement had been made concerning the identity of the passenger who was to accompany Chamberlin. The plane was made ready, Chamberlin was in his place, and with no flourishes or statements Mr. Levine stepped into the plane and it was off. This one act demonstrated that the criticisms of the sportsmanship of the financier who was backing Chamberlin had no foundation in the real character of this man who was willing to risk his life and leave fortune and family behind.

Chamberlin had one intention, and that was to break the record for no-stop flight, which had been broken twice within the past month. With weather conditions none too propitious the Columbia reached Nova Scotia two and a half hours late and several miles off the course. Head winds of high velocity not only kept the speed of the

Chamberlin leaving Long Island in the early dawn of June 4, on the Trans-Atlantic flight.



plane down but each minute lost at this early stage of the journey meant actual distance clipped off the possible limit of flight.

Leaving Halifax the wind shifted somewhat and they were able to make up some of their lost time. At Cape Race, Newfoundland, they lost sight of the American continent, with nothing in front but ocean and either Europe or death ahead. Fog, the great enemy of navigators in the air or on the water, was fortunately not encountered on the Grand Banks, the one place where it can generally be expected. Icebergs were seen by the score, but fortunately the visibility was high and the flyers could see for miles.

After clearing the Grand Banks heavy fog was encountered. Mr. Kimball, of the New York Weather Bureau, who had worked with Chamberlin and advised him as to weather conditions, had advised a swing to the southward in case fog was encountered. This was done, causing another loss of time and distance, but conditions moderated. Fog was again encountered, and this time the navigators were unable to escape it. They tried mounting to an altitude of 15,000 feet, and descending to within a few feet of the water. The temperature continued to rise and they were afraid that they were getting too far south. Doubt as to their ultimate destination began to occupy their minds.

On they flew, determined to maintain an easterly direction, and hours later were gladdened by the sight of the Mauretania. They circled over the liner and were able to read its name plainly. Descending to within a hundred feet or so the Columbia was easily recognized and the markings on the wings of the plane deciphered by the officers of the Mauretania who radioed to the country the first definite information obtained since the flyers left Cape Race.

Levine had a copy of the New York Times with him and by turning to the steamship news he found a list of sailings. From this the two men computed the time the Mauretania had been on the seas and roughly worked out their position as about 400 miles from Ireland. This calculation was afterwards found to be very nearly right.

In a few hours Ireland was sighted and success was at hand. It now became a question of flying until the fuel gave out. Adverse weather conditions, and winds might further cut down the extent of the flight. Radio announcements in the United States were soon reporting them as seen over England, Belgium, Holland and Germany.

The gasoline supply definitely gave out and the men were compelled to land at Helfta, in Germany, to refuel for the trip to Berlin. Berlin was only a hundred miles from Helfta. An aviation mechanic was discovered in this small town and the plane was given a hasty inspection. They again took off, but losing their way, they descended in a swampy piece of water at Kottbus, only fifty miles from Berlin. The propeller was broken in this landing and the flight had to be discontinued temporarily.

The little town of Kottbus went wild over the two Americans and a taste of the round of receptions and fetes that they were to face for weeks was given them. Meanwhile the German aviation societies were scouring Germany for a duplicate propeller that would fit the Columbia. Newspaper men, heads of reception committees and officials hurried to Kottbus to make arrangements with the flyers that would take their entire time for weeks.

Finally the new propeller appeared, one of the flying clubs being fortunate enough to locate one of the same make that could be fitted to the Columbia with no loss of time.

Unofficially the distance flown by

Chamberlin (second from left) and Levine (second from right) greeted by officials of Kottbus, Germany.

Chamberlin was estimated to be 4,400 miles. The actual flight distance can never be actually computed as there is no way to check the variations from the course that the men were forced to make due to adverse weather. The actual straight line distance to the landing point was practically 3,900 miles, a record breaking accomplishment. The plane had been in the air 43 hours—another record.

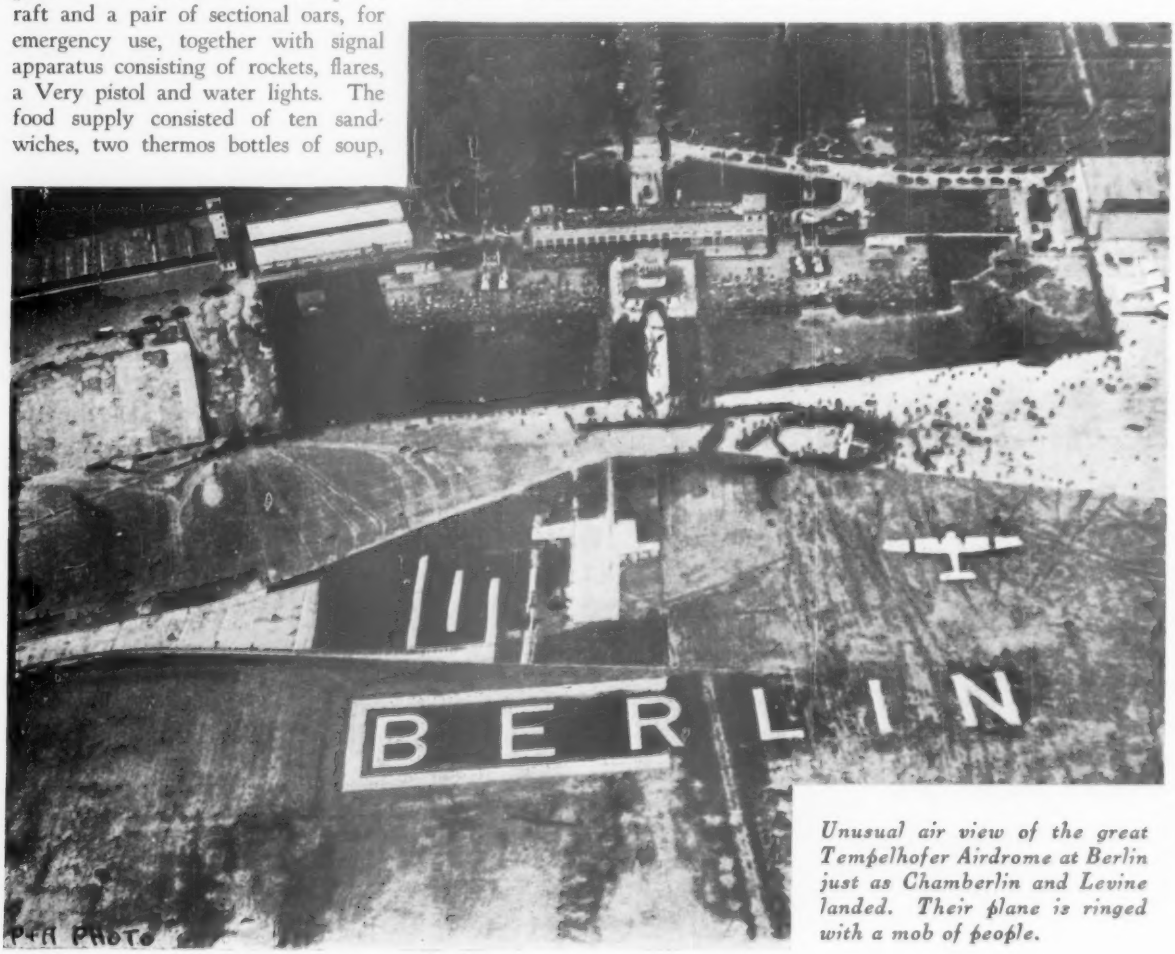
German aviators were amazed at the weight carrying capacity of the Bellanca plane. The usual German ratio is about two to one, that is, the average German plane carries about half its weight. Some of them reach a one-to-one ratio and are able to fly with a load equal to the actual plane weight. The Columbia carried twice its own weight, an astonishing performance in the eyes of the German designers and engineers. The Columbia's load consisted of a main tank of 390 gallons of gasoline, and auxiliary wing tanks with a capacity of 65 gallons. The plane also carried a small collapsible raft and a pair of sectional oars, for emergency use, together with signal apparatus consisting of rockets, flares, a Very pistol and water lights. The food supply consisted of ten sandwiches, two thermos bottles of soup, one of coffee, six oranges and three tins of U. S. Army emergency rations. The entire load weighed 5,450 pounds.

Guiseppe M. Bellanca, designer of the Columbia receiving news of the successful flight.

Captain Wentscher, a recognized German aviation authority, is quoted as saying: "This flight was achieved mainly through the Wright Whirlwind motor, of which the world, to say nothing of Germany, has no equal. It is air cooled, but, whereas in the case of other motors of similar construction what is gained by doing away with the heavy water cooling apparatus is more than offset by increased gasoline consumption, this Whirlwind consumes even less gasoline and oil than water cooled motors of the same horsepower."

German authorities were not all unanimous in their praise of the Bellanca, some of them expressing a decided opinion that planes should be of all metal construction. As the flyers have pointed out, the saving of weight by fabric construction means greater distance in flight.

Chamberlin and Levine received the plaudits of every German and Austrian city visited. Gifts and honors have been showered on them and they were the center of attention in Germany for weeks.



Unusual air view of the great Tempelhofer Airdrome at Berlin just as Chamberlin and Levine landed. Their plane is ringed with a mob of people.

Byrd

Byrd's plane, the "America," at Roosevelt Field, Long Island, waiting for an opportunity to take off across the Atlantic.

Just as Popular Aviation goes to press the newspapers of the country, and the radio, are announcing that Commander Byrd, with Bert Acosta, flight pilot, George Noville, flight engineer, and Bernt Balchen have left Roosevelt Field, at 5:24 a. m. Eastern Daylight Time, June 29 for Europe.

In spite of heavy fog over the North Atlantic weather conditions were said to be fairly favorable, though not approaching the ideal.

First European Air Mail. Commander Byrd is being sworn in as the first official trans-Atlantic air mail carrier by Postmaster John J. Kiely of New York City. The bag contains 200 letters.

The Honolulu Flight

STARTING in a cloud of dust whirled into the air by three great propellers of the army Fokker monoplane Lieutenant Lester J. Maitland, pilot, and Lieutenant Albert Hegenberger, navigator, left the Oakland, Cal., Municipal Airport at 7:10 on the morning of June 28, bound for Honolulu.

The tri-motored craft had been flown across the continent by these two men, in a test flight to determine the carrying capacity of planes for army use. Sandbags equivalent to the weight of thirty men were taken aloft. Every conceivable test was given the Fokker by the flyers.

Rumors had been occupying the press for days that the two officers would take the plane on the Pacific flight, but the War Department steadily withheld all information until the final tests were completed at San Francisco. It was then announced officially that the flight was sanctioned and would take place at the discretion of the pilot and navigator.

Both men have splendid air records. Both enlisted in the aviation section of the signal corps in 1917, when the United States entered the war. In 1923 Maitland broke the then world record by flying a Curtiss racer over a one kilometer course at Wilbur Wright Field, Ohio, at a speed of 244.97 miles per hour. He later became assistant executive in the office of Assistant Secretary Davison, when the latter was appointed to handle army air activities.

Lieutenant Hegenberger turned to the engineering and navigating phase of air work and became chief of the instrument and navigation branches of the engineering division at McCook Field, Ohio. Like Maitland he has served in both Texas and Hawaii.

The preparations of the army were carried on in what practically amounted to secrecy. Although ships were expected to report the progress of the plane the army officials did not ask for the formation of ship lanes or request any aid from either the navy or the shipping board. The navigation instruments and radio beacons were to receive a practical application under severe test conditions.

Grace's plane being loaded on the steamer for Hawaii.

It was announced at the field that the army plane would cruise along at a speed of about 90 miles per hour and as the gasoline load lightened the speed would be increased to about 125 miles per hour.

As the great plane took off five escort planes followed but the Fokker left them far behind, traveling at a speed of 140 miles per hour, so that by the time the escort reached the Golden Gate the monoplane was far out over the Pacific.

On this, the longest over water flight ever attempted, with one exception, the Fokker carried a full load of 1,040 gallons of gasoline, estimated to be sufficient for a cruising radius of 3,000 miles. The gross weight of the plane was 13,500 pounds, which included the radio beacon device, receiving and sending radio set, ordinary navigation instruments, signals, and a small food supply.

With favoring winds, none of them attaining a velocity of over 25 miles per hour the trip was made without

incident, the plane being sighted off the coast of Hawaii well within the 24 hour limit which the flyers had set for themselves.

They landed at the army field, twenty-five miles from Honolulu, the first aviators to make an oversea flight of that distance successfully. Readers will recall the dramatic flight of the late Commander Rodgers whose plane made a similar trip but fell in the sea about 300 miles northwest of Honolulu.

Lieutenant Albert Hagenberger (left), navigator, and Lieutenant Lester J. Maitland.

This successful flight is considered by army officials as a demonstration of the perfection of present day aerial navigation instruments and the forerunner of commercial service to the Hawaiian Island.

At the time of the army officers' take-off, another aviator was waiting to make the same flight. Two hours and a half later, Ernest L. Smith, with Charles Carter as navigator, left the same field bound on the same mission to break the over-sea flight record. The breaking of Smith's windshield forced a return of the plane and the postponement of the flight.

Interest in the San Francisco to Honolulu flight started some months ago when the Dole Prize was offered for the first successful flight to Hawaii. Interest redoubled when the San Francisco Chamber of Commerce offered $50,000 for a round trip flight.

Many other aviators have been attracted to the Pacific Coast and have declared their intention of making the flight for the two awards.

Richard Grace, aviator for one of the large motion picture companies, left Los Angeles by steamship with his plane in the hold, for Hawaii, where he will attempt the flight to San Francisco.

Grace's project for winning the $50,000 prize offered for this accomplishment is being backed by Major Grant E. Dodge, of Los Angeles and Pasadena. Lieut. Eston B. Koger, of the naval reserve, accompanied Grace on his trip to Honolulu and will plan the trip as to navigation. Grace's mechanic is C. C. Spangenberg.

Grace expects to make the flight alone in his Wright motored Ryan monoplane. The plane has been stripped of all non-essentials and extra gasoline tanks added.

Chester Tallmadge, of Albuquerque, N. Mex., has announced his intention of attempting a round-trip flight from San Francisco to Honolulu some time in July or August. F. D. Gibson, a New York oil man, is the principal backer of Mr. Tallmadge, who was an aviator with the Royal Flying Corps during the World War.

Herman Hamer, of Ladd, Ill., who finished second in the national airplane races at Flint, Mich., last year also plans to enter into this contest if he can obtain the proper backing.

Lieut. Leigh Wade, one of the round-the-world flyers, and Linton Wells, a former California newspaperman, are also figuring on including the Honolulu flight in their effort to circle the world in 15 days.

L. H. Atkinson, of Gary, Ind., has announced his intention of competing for the Dole prize for the first flight to Hawaii.

Jessica Day, a California girl aviator, has also made application for the Honolulu flight.

Milo D. Kent, head of the flight committee for the San Francisco Chamber of Commerce, appealed to the United States Bureau of Aeronautics, Department of Commerce, and requested Secretary Hoover to make a ruling that would apply to certain airmen that were planning the trip in planes that were unfit for the trip. Assistant Secretary McCracken, in charge of the Bureau, has issued special licenses to practically all of the men contemplating the trip. These licenses give the aviators special rights as experimenters to use their planes in interstate commerce. Licenses to fly plane are only denied on the ground that the mechanisms are unfit.

Roy Ahearn, 1211 Elmdale Ave., Chicago, Ill., will be one of those who will try for the Dole prize for a successful flight from San Francisco to Hawaii.

XUM

Aerial Photography and Surveying

By E. W. Fuller
Chicago Aerial Survey Co.

The first of a series of articles on a fascinating branch of aviation, written by an authority on this particular development of aerial service.

THE first man who pointd a camera earthward from an airplane and snapped a picture, must have done so because he was fascinated with the view he had, and, feeling it to be indescribable in words, tried to bring a picture of it down to show those on the ground. The pattern of almost any portion of the earth's surface seen from an airplane assumes unthought-of combinations and symmetries and is at once so vast and diminutive that it exercises a peculiar fascination.

One who turned out to be a great ace during the war tells of his happening to look in a street window while wandering in Paris and seeing an aerial photograph of some area of the battle front that looked so much like the design of a Turkish rug on a grand scale that he was, by studying it, stirred into an ambition to enter the flying corps. He did so and made his name famous.

The camera in the sky has indeed turned out to be the mirror by which the world may look at itself, for by no other means can such great areas be studied so rapidly and in such thorough detail.

The art of aerial photography may be said to have sprung from the World War, for, although photographs had long before been taken from movable towers, kites and balloons, it was the swift development of military flying which raised photographing from the air out of a haphazard method of picture taking to a special science that served armies with quick and accurate intelligence data. It was quickly found that successful photographs from airplanes could not be consistently obtained by using the ordinary equipment of the commercial photographer. More rigid construction of the camera box was required to withstand the vibration of the moving plane, and the ordinary bellows had to be replaced with solid housing for the lens to stand against the great pressure of the wind and the propeller blast. The aerial camera as used today is therefore a very specialized type—a rather complicated mech-

anism of great delicacy and strength. Likewise, the uses of the aerial photograph have developed and broadened since the war, and the work of making them and applying them to commercial needs has grown into a business of diverse service, reaching its highest phase as aerial surveying.

The beauty and impressiveness of architecture are revealed in their greatest force when seen from a height tion fixed by the lens for reproduction in picture.

Groups of buildings, comprising factories, large plants or parks can be shown from the air in a way that gives to each detail of the whole its proper identity, removes clutter, minimizes obstruction, and brings into the open the whole arrangement with clearness and absolute accuracy.

The science of advertising long ago interest. The stability of a prospering factory or plant is indelibly imprinted on the mind by a comprehensive aerial photograph. Its truth is unquestionable. It speaks all languages.

The merit of a product is reflected by the atmosphere in which it is made. The aerial photograph reproduces that atmosphere perfectly—such a view is the highest stamp of reliability—an indication in itself of the last word in

Part of Chicago's Business District. Note the clearness with which the individual buildings stand out in spite of the masses of other buildings.

which also allows an appropriate vision of the surroundings. The air plane circling above has infinite points of vantage to look from and the experienced aerial photographer, selecting the best, fixes that view on the plate of his camera and brings to earth a permanent record of it—a picture that can be obtained in no other way.

A building standing alone will be imaged without the foreground distortion impossible to remove from low, near views.

A structure rising among others can be readily singled out by the aerial camera and its most commanding posi-

discovered that appropriate illustration was not the only chief element of attention-getting, but that the picture itself is the major influence in carrying persuasion and creating a lasting impression.

The aerial view always rivets attention by its novelty and the peculiar artistry attached to it. It arouses lively

quality and up-to-the-minute facilities.

Bond and stock advertisers recognize the extarordinary value to be had from the large scope of the aerial view. A photograph of the complete properties of an enterprise or business being underwritten gives life to the financial statements and description. The investor can see for himself the nature, condition, and physical possibilities of the project in which he is asked to put his money.

For the realtor, the aerial view points out with unerring precision the advantages of location, the adjoining properties, communication facilities,

XUM

and every feature that gives a site its value.

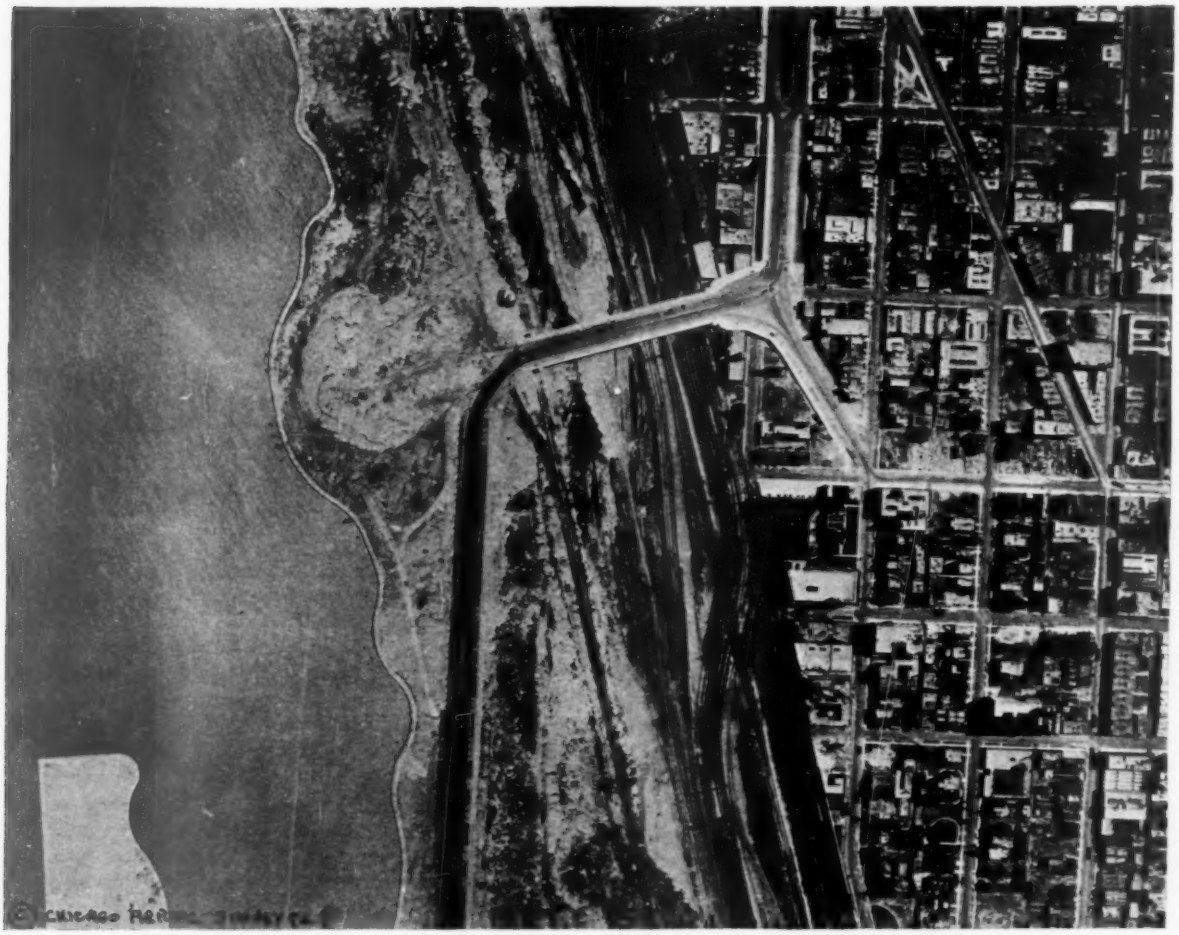
The vertical view from the air—that given by the camera pointing straight down at the surface of the earth—fulfills a wide range of uses. It serves every purpose of a scaled blue print and is enlivened by absolute detail—every object visible to the sun being revealed in exact outline and with all relationships of detail perfectly preserved.

For hydraulic and electrical engineer the aerial photograph provides a physiographical map that enables him to study his project with the same accuracy given in a blue print and with the tremendous addition of having every physical feature in exact detail before his eyes. It is, in fact, the same as giving him an observation office in a balloon hung above the scene of his work. Where selection of sites is involved the aerial view gives him the complete outlay of a district no matter how extensive; the confluence of waters, the topography of land, the location of forests, roads, bridges, railroads, towns, buildings, etc. For purposes of explanation to boards of directors or to principals too far distant for visiting the scene of prospective operations, the aerial view gives the whole situation at a glance and with a faithfulness that admits of careful and intensive study for other uses. It fulfills the multitude of needs demanded where propaganda to capitalists or other interests is required. In selecting rights of way for transmission lines it provides an accurate survey quicker and much less expensive than a ground survey.

The railway engineer finds the aerial map of vital importance in studying terminal problems, trackage and switching yards in cities and in showing the progressive development of work under way. Aerial views can assemble in one office illustrative data of any part or all of an extensive railway system. The photographs are intelligible and appealing to any official or delegation who consults them—a use which no amount of expensive line drawings and pen sketches could accomplish. Such use will ultimately make needless a vast amount of expensive and inconvenient traveling on the part of railway officials, and will add immeasurably to efficiency in the work of all maintenance problems and improvements conducted by the main engineering office. The railway engineer who is confronted with the selection of a new right of way can have several routes mapped to scale from the air and presented in complete detail without any knowledge on the part of the inhabitants of the territory in prospect of being traversed. From these his final choice can be made. The

A Vertical View

Compare this with the previous oblique view of part of the same district.



Traffic conditions, housing congestion, property locations can be easily studied from air photos.

expense would be infinitely less than that of a ground survey. Landscape designers, in laying out parks, golf courses, large estates, boulevards and cemeteries, utilize both the oblique and vertical photographs for plan studies. City planning commissions and chambers of commerce employ them in zoning problems, to assist in the correction of past errors and in the prevention of future ones. Every town and city will eventually provide itself with complete aerial maps of its entire area taken every few years to disclose all features of its physical changes and growth, and to furnish an accurate basis or a check in making tax appraisals.

The aerial mosaic map is made with a special automatic camera. The camera points vertically through the floor of the airplane and is suspended on a balancing device fitted with instruments by which the operator keeps the camera in exact equilibrium. A wind motor turns the film roll and releases the shutter so that an exposure is made regularly every few seconds of flight, each exposure overlapping by a certain margin the one preceding. The printed photographs are then carefully matched and fitted together, the scale being regulated by the altitude of flight and focal length of the lens. The scale may be changed as desired by enlargement or reduction from the negatives in the laboratory.

African Mining Survey

The Rhodesia Congo Border Concessions, Ltd., has let a contract for the aerial survey of 50,000 square miles of property in Northern Rhodesia.

This is the first time that planes have been used for making a preliminary mining survey in Africa. It is planned to take both vertical and oblique photographs of the territory. In this way a scale map and a reconnaissance index can be made. The planes will be equipped with automatic cameras and will take photographs on continuous rolls of film 65 feet long, with marginal notations showing time of exposure and height.

French Forest Protection

The large pine forests of Alsace and Lorraine have been attacked by insect pests that threaten the destruction of the trees. The French have been using dusting planes for destroying the insects. A plane carrying a load of 250 pounds of arsenate of lime with a dusting hopper arrangement is flown back and forth over the infected area quite close to the trees. So far the results have been successful and the cost small.

Gliders and Motorless Planes

One of a series of articles dealing with man's inventive genius in conquering the air.

One of the first of the Wright brothers' glider models in flight.

IT is significant that when flying became an accomplished fact that success attended the men who had made a study of gliders. Pioneer attempts to fly with motored machines were attended with failure because man had not mastered the art of gliding.

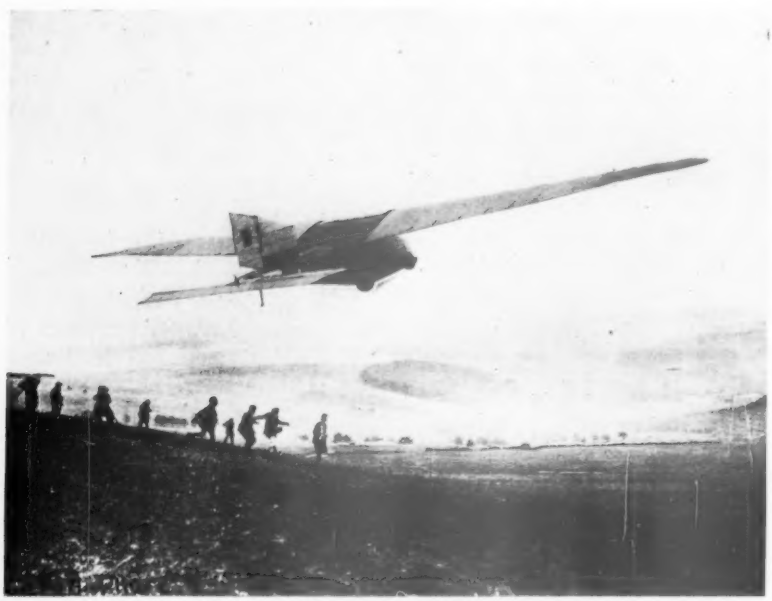
The flight of birds, swooping and soaring with little or no apparent effort, had long interested experimenters and efforts to duplicate the results of birds had engaged many men. Failure attended practically every flight where man tried to imitate the flapping of a bird's wings, and not until man concentrated on the effort to find out why a bird's wings sustained it in the air was any great progress made.

As early as 1500 Leonardo da Vinci, the painter, sculptor, architect and engineer, became interested in the problems of flight. He experimented with paper propellers and aerial screws and made a deep study of wing surfaces of birds. In his notebooks several sketches have been found showing that he seriously contemplated building a machine for flying.

One of his sketches shows a device consisting of a pair of mechanical wings, carrying straps to hold a man's body, a rudder-like tail, and connecting cords so that the operator could lift the wings by means of his arms and pull them down by leg motion. The rudder or tail was also operated by the legs. This apparatus was never built.

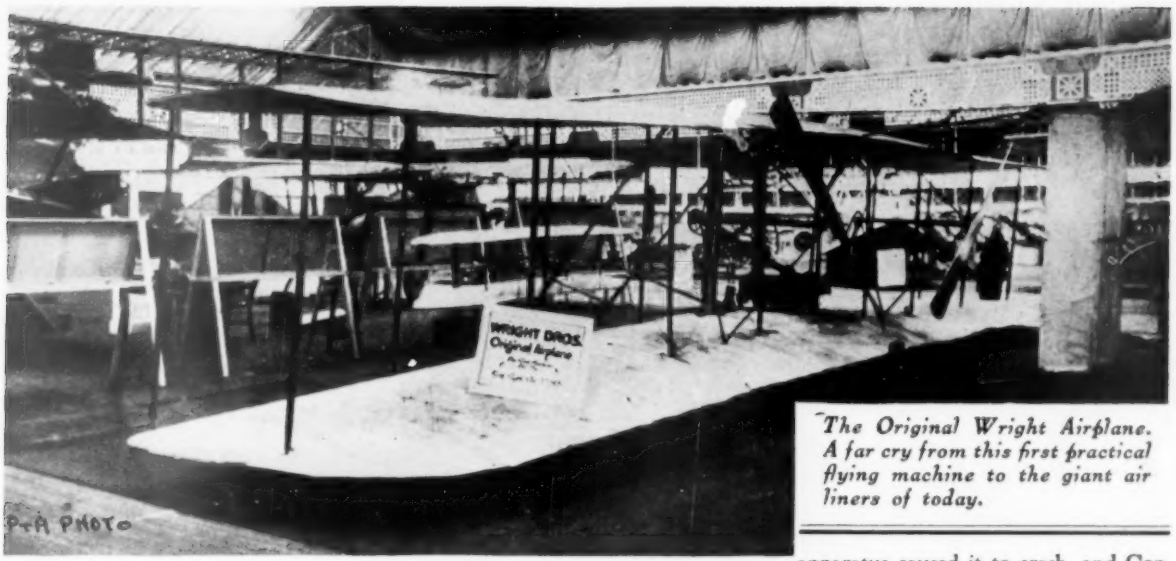
Numerous men, particularly in France, became interested in flight, and some eye-witness accounts of very short glides are found. These early experimenters apparently failed to grasp one essential fact in bird flight—the relation between weight carried and wing surface. The duck has the heaviest body for the size of its wings, and should man be able to fly, his wings, to carry out the same proportions as that of a duck, would have to have about 70 square feet of supporting surface. None of these early flying enthusiasts were able to make devices having so much wing surface. If the wings were small enough to wave rapidly they afforded too little support and the larger wings were too unwieldy to move.

A Modern German Glider. This machine stayed in the air for hours, winning one of the Rhon competitions.



Sir George Cayley, an English country squire, published a valuable series of articles in Nicholson's Journal in 1809 and 1810. This investigator had made successful glides from hilltops and was convinced that flying was practical, but not under conditions of his day. He stated that it was necessary to "have a first mover (engine) which will generate more power in a given time, in proportion to its weight, than the animal system of muscles." Not quite a century later the Wright brothers redesigned the gasoline engine to provide adequate power with small weight—the real secret of flight. Cayley differed from most of his predecessors by advocating fixed wings instead of flapping ones, and suggested the use of curved or cambered surfaces instead of flat ones. In many ways he showed that he knew what an airplane should be.

In 1848 John Stringfellow, an English engineer with a genius for building miniature model engines, constructed a monoplane model which actually sus-



The Original Wright Airplane. A far cry from this first practical flying machine to the giant air liners of today.

tained itself in the air by means of a small steam engine. The complete model and power plant weighed but eight and one-half pounds. As no provision could be made for keeping up steam, the model would descend as soon as the pressure fell off.

A triplane model of Stringfellow's was exhibited in London in 1868 and is now in the Smithsonian Institution at Washington. W. S. Henson, an English lace manufacturer, financed some of Stringfellow's experiments and actually founded a company for transporting mail, passengers and parcels by air. In spite of the promise of success in the small models, the big plane was never built.

Sir Charles A. Parsons, developer of the marine turbine, built a model airplane with a wing span of 11 feet. It was a monoplane and had 22 square feet of surface supporting a tiny steam engine and boiler. This plane weighed but three and a half pounds complete and made flights up to about a hundred yards. Like Stringfellow's model, it would then fail for lack of steam pressure.

Samuel Pierpont Langley, the Secretary of the Smithsonian Institution, Washington, D. C., became interested in the possibilities of mechanical flight. He became convinced that the power needed to lift a plane in the air and support it in flight was much less than that stated by physicists of the day. He constructed two model aerodromes, as he called them, of biplane type, or, rather, double monoplane. His "aerodrome" consisted of a larger monoplane in front with a smaller one directly behind it. Between the two hung a boat-shaped hull to house the power plant and to permit alighting in water.

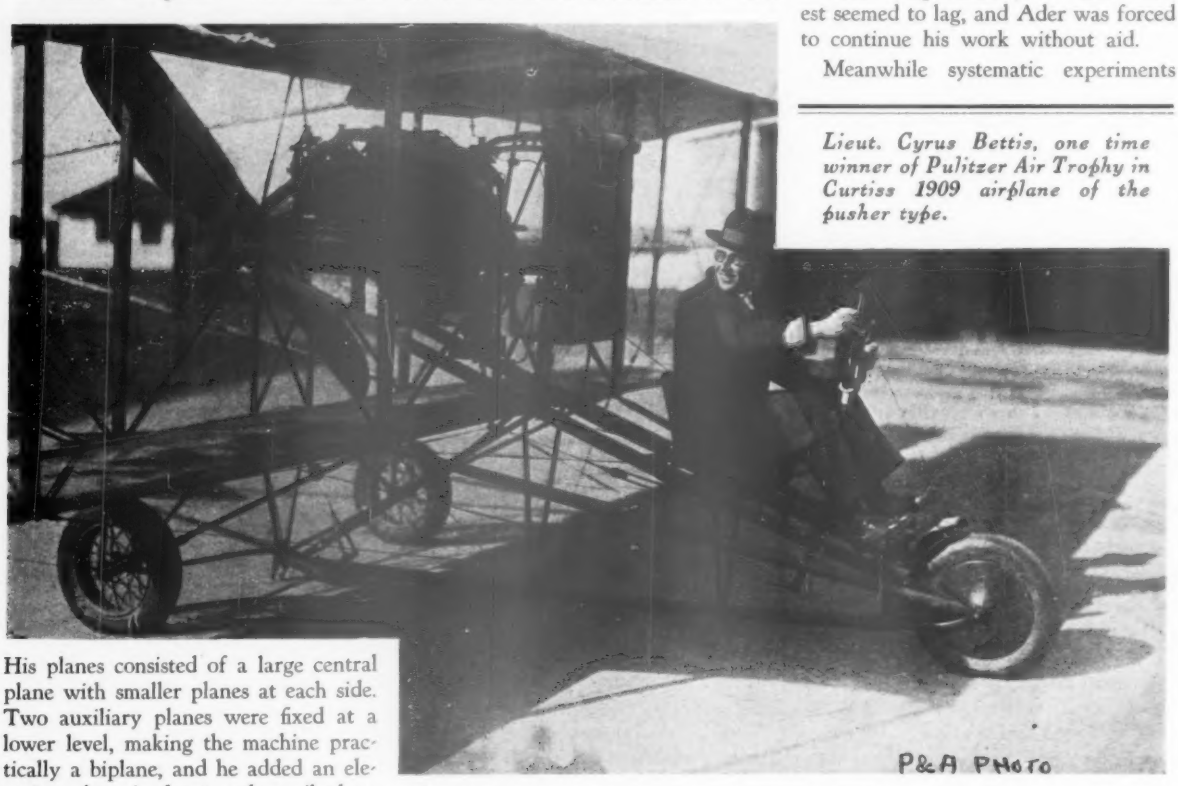
Langley's models made successful flights, and Congress made a grant to permit him to build a plane of sufficient size to carry a man. On October 7, 1903, and again in December the same year, tests were made of this machine, but a defect in the launching apparatus caused it to crash, and Congress refused further grants. Scientists agree that Langley actually demonstrated the possibility of flight, and since that time Glenn Curtis has actually made a flight in Langley's machine. Refitted with a larger and heavier motor, it was proved that Langley had the right idea and that his design was practicable.

Hiram Maxim, inventor of the machine gun, set about solving the problem of flight in a practical manner. After much experimenting with propellers, wing surfaces and struts, he started his work by the construction of a highly efficient steam boiler and engine. His

The full-sized man-carrying model of Langley's machine on the houseboat from which it was launched.

power plant, which developed between 300 and 350 horsepower, weighed about 7 pounds per horsepower for boiler, engine, fuel and water—a low figure for that day.

This power plant was mounted on a platform which supported a framework on which the planes were mounted.



Lieut. Cyrus Bettis, one time winner of Pulitzer Air Trophy in Curtiss 1909 airplane of the pusher type.

His planes consisted of a large central plane with smaller planes at each side. Two auxiliary planes were fixed at a lower level, making the machine practically a biplane, and he added an elevating plane in front and a tail plane in the rear. He had a total sustaining surface of 4,000 square feet, and the total load, including three men, was 8,000 pounds, or 2 pounds for each square foot of plane area.

Maxim did not intend to fly into the air, but simply to prove that a heavier than air machine could rise from the ground and sustain itself in flight. Accordingly he mounted his platform on wheels which ran on rails laid 9 feet apart. He built a track about 1,800 feet long, and above this track built another, with rails inverted. This track was laid a distance above the first track so that should the machine rise a few inches off the ground rails the wheels would engage with the inverted track on their upper side. Maxim succeeded in operating this machine in July, 1894, and proved to his own satisfaction and that of those who saw the experiment that his device could rise from the ground and travel along the track without touching the lower rails. Unfortunately, a shortage of funds prevented Maxim from going on with his experiments.

Clement Ader, a French electrical engineer, had been constructing experimental flying machines since 1882. One of Ader's fixed wing machines is preserved in the Paris Museum of Arts and Handicrafts. It suggests a bat, with its arched and pointed wings.

It has been claimed that Ader, in his "Avion," which weighed about half a ton, made a successful free flight of several hundred yards on October 11, 1897. The destruction of the machine upon landing, and the fact that his experiments were carried on in secrecy, make it almost impossible to prove the fact, and thus to give Ader the honor of making the first flight in a motor driven heavier than air machine. The French Army for a time was interested in Ader's experiments, but their interest seemed to lag, and Ader was forced to continue his work without aid.

Meanwhile systematic experiments with gliders had been carried on by Otto Lilienthal of Anklam, Germany. Lilienthal, by watching young birds learning to fly, discovered the necessity of taking off into the wind instead of before it. He succeeded in making glides up to 300 yards in length and at times was able to attain heights that were greater than that of the starting point. To aid him in his work he constructed an artificial hill, of a cone-like shape, so that he could take off into the wind regardless of its direction. For the first time gliders had been brought to a point where it was possible to control them with some accuracy and to rise by taking advantage of the wind currents. Lilienthal was experimenting with an engine to operate his wings at the time of his death.

Percy S. Pilcher, an English marine engineer, also built gliders and made flights up to 250 yards in length. Pilcher added a wheeled undercarriage for

(Continued on Page 45)

Height Records

Year	Pilot	Height
1908	Wright Bros.	360
1910	Hoxsey	11,474
1911	Garros	13,943
1912	Garros	19,032
1913	Legagneaux	20,668
1914	Oelrichs	26,246
1919	Lang	30,500
1920	Schroeder	33,113
1921	MacReady	34,509
1923	Sadi-Lecointe	36,555
1926	Callizo	40,810

An A-B-C of Aviation

By Clement A. Young

To the person who knows nothing of the theory of aviation many questions present themselves at the start. The chief one is, of course, "What makes a plane fly?" The answer is not so simple. To answer this single question the matter of air pressures and plane surfaces have to be gone into.

Briefly, this question may be answered by stating that an airplane in flight is a body, heavier than the air, which is held aloft by supporting surfaces and moved forward by a propelling force. The wings are the supporting surfaces and the engine operated propeller supplies the motive power.

The simplest illustration that can be given of a plane surface and its action in the air is that of a kite. In the air the plane surface of a kite is tilted with the top edge further into the wind than the bottom edge. The wind exerts a pressure against the surface of the kite, roughly speaking, parallel to the earth. The tendency of the wind is, naturally, to blow the plane surface of the kite along in the direction of the wind. This movement is prevented by the pull of the kite string downward. The string not only pulls against the force exerted by the wind, but the bridle arrangement by which it is attached to the kite serves to keep the kite in the proper position to receive the pressure of the wind.

Longest Non-Stop Flights

Year	Pilot	—Time— H.	M.	S.	Dist.
1903	Wright			59	*852
1904	Wright		5	4	3
1905	Wright		38		24
1908	Wright	2	20	23	95
1909	Farman	4	17	53	144
1910	Tabuteau	7	48		365
1911	Fourney	11	1	29	447
1912	Fourney	13	22		628
1913	Seguin				634
1914	Boehm	24	12		1,350
1923	Kelly & MacReady	26	50		2,635
1925	Drouhin & Landry				2,734
1926	Challe & Weiser				3,213
1927	Chamberlin				3,610

** Feet.*

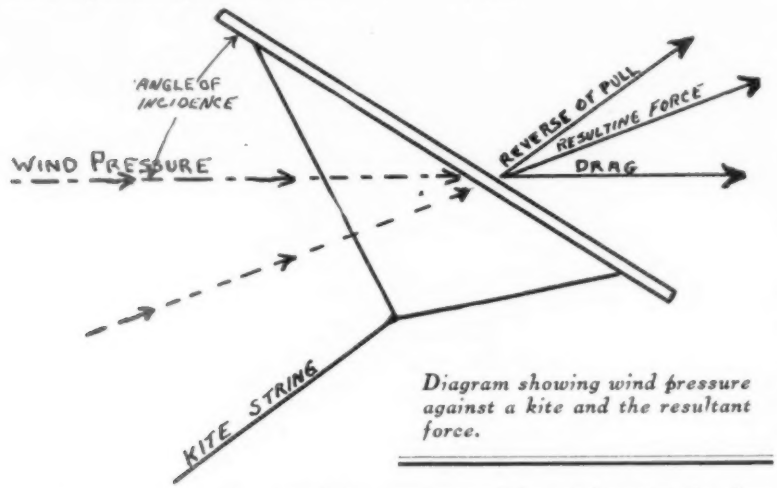


Diagram showing wind pressure against a kite and the resultant force.

Here we have two opposing forces, the pull of the string being less than the push of the wind, but equal to the pressure of the wind against the plane surface, and the force or pressure of the wind itself against the kite surface. The result of the opposition of the two forces is to change the direction of the application of the greater force somewhat. Following a law of physics this force is exerted at an angle against the surface, causing a lifting and sustaining pressure against the kite.

The same thing happens with an airplane in the air. A plane takes off against the wind. Omitting what happens up to the time the aircraft is actually in the air, the craft is held in the air by the pressure of the air against the underside of the wings. Ordinary wind would not exert sufficient pressure against the under side of the wings to hold the craft up, so additional pressure is supplied by moving the plane through the air by means of a motor driven propeller.

There is another factor which adds to the support of the plane in the air, one that was not at first discovered. Experiments made with plane surfaces —aerofoils—in laboratories, by blowing smoke under pressure against planes showed clearly the course that the air under pressure took upon striking a slightly tilted plane. The smoky air could be seen to strike with full force against the under side of the tilted plane, but it rose rather high in passing the upper surface, producing an area of suction on the top side. Thus, added to the pressure of the air on the under side of a wing we have the suction effect of the air passing over the top. This increased the lifting power of the wing.

Experiments with models, and in laboratories, soon showed that great variations in plane surfaces produced great variations in sustaining ability. It was soon established that the advancing edge of a plane should be the longest in comparison with the other measurement. In other words, if a wing measured 12 feet by 4 feet, it was much more efficient when the 12-foot edge was the advancing edge. The wing has the same amount of sustaining surface in each case, but when the four-foot edge is advanced against the air the sustaining power is much lower.

In other words a good sustaining plane should be long when viewed from the front and short when looked at from the side.

Many experiments were conducted with models based on bird shapes, but in man-made machines we have disadvantages to overcome that do not exist in a bird. A bird is able to flex his wings and to depress one or the other. In a rigidly made airplane wing flexion cannot be had without sacrifice of both strength and rigidity. Birds have a stabilizer in their tail feathers,

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but nothing that corresponds to the rudder of the aircraft. If a sufficiently rigid wing could be built with tips that could be easily flexed the rudder might be done away with, but the rudder seems to work better. Lilienthal's last glider model had flexible wing tips.

Experimenters soon copied the shape of the bird's wing in cross section. Early planes were cambered, that is, concave on the under side and convex on the upper side. A study of a bird's wing will show that it is thick on the leading edge and feathers away on the trailing edge. At first thought it would seem that a thin leading edge would cut down air resistance. It does, but there is a sacrifice of the suction on the upper wing surface. Planes are being designed now with the leading edge stream-lined but of great thickness. Gasoline tanks and motors are even carried in the thick portion of the wing. One contemplated plane will carry passengers in the wing. Of course this is a plane of enormous size.

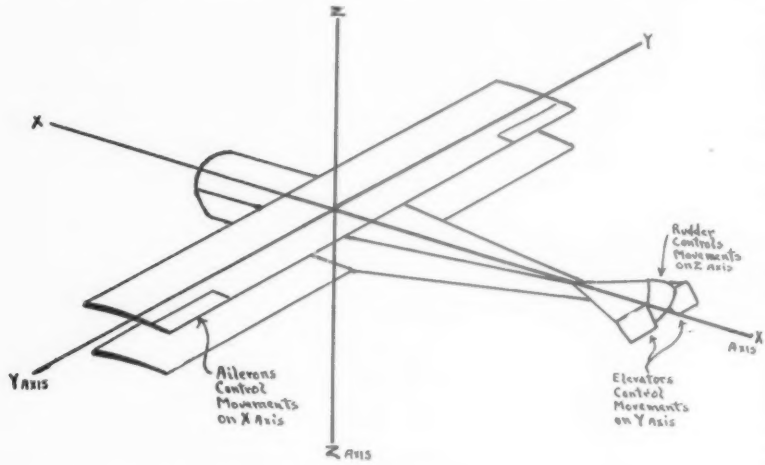
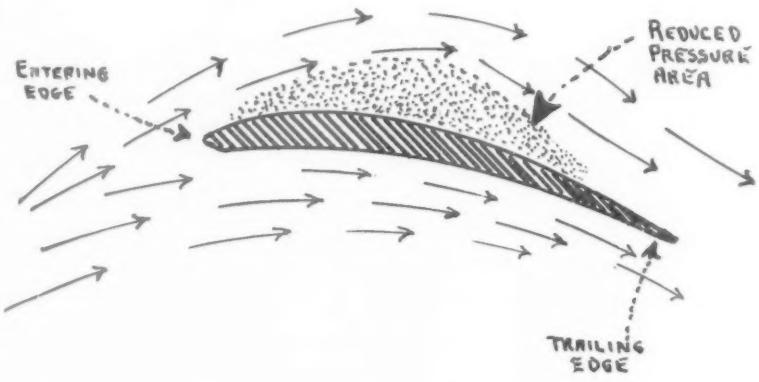


Diagram showing the axes of an airplane and the effect on controls on the plane.

Diagram showing air pressure and suction area on an aerofoil subjected to pressure. Arrows show direction of pressure.



Little need be said about the rudder of a plane, as it acts in the same manner as the rudder of a boat, the pressure of the air against it forcing the tail about and thus changing the direction of flight. Flight direction can also be changed, in a wide course, by the action of the ailerons.

Ailerons are hinged portions of the trailing edge of the plane. When depressed the aileron causes the wind to strike with greater pressure on that wing, forcing it to rise higher than the other wing. Similarly, when the aileron is raised the pressure against the lower part of the wing is decreased and the pressure against the upper part is increased, depressing that wing. Of course the wing itself does not actually move, but the plane is tilted along its longitudinal axis.

The tail of the plane serves in one measure as a balance for the motor, which is placed in the nose of the aircraft. The tail holds the rudder, stabilizer and elevators. The stabilizers are generally adjustable so as to compensate for the variable weight of the load so that in normal flight the ship will ride with the tail in the proper position, neither depressed nor elevated. The elevators are in effect horizontal rudders, and act in the same manner. Elevating them forces the tail of the plane down. The plane then swings on its center of gravity and the nose goes up, the plane then following the changed direction. Conversely, when the elevator is depressed the wind pressure forces the tail upwards, swinging the nose downward.

(Another article by Mr. Young will appear in an early number of POPULAR AVIATION.*)*

Radio Communication

The problem of continuous and reliable radio service between a flying plane and a ground station has long been a subject of experiments. Radio communication with a pilot, from the ground, has been practicable for a long time, but no reliable method had been devised for allowing conversation both ways.

In a recent test Dr. Dellinger, in a plane flying above Bolling Field, Washington, carried on a conversation with Assistant Secretary of Commerce for Aeronautics William P. MacCracken, Jr., who was at his desk in his office. MacCracken's voice was relayed to the Chesapeake & Potomac Building and from there was transmitted by radio to the plane. Dr. Dellinger's voice was received by radio at the department's experiment station at College Park, Md., and relayed by telephone from that point to Secretary MacCracken's desk in Washington.

The plane carried both a receiving and transmitting set, which were operated by Howard Pratt, radio operator for the Bureau of Standards. The shift from receiving to sending was made in the plane, all connections being in operation at once.

Two days later station WRC of the Radio Corporation of America broadcast a conversation between Dr. Burgess and W. B. Stout, head of the Aircraft Division of the Ford Motor Com-

(Continued on page 45)

Forecasts and Prophecies

"I expect to see regular commercial flights across the Atlantic ocean made swiftly and safely and profitably."—Charles Lindbergh.

"The feat performed by Chamberlin and Levine again convinces us that transatlantic flying is getting to the practicable point. Soon there will be big planes with many engines in a regular ocean crossing service."—Guiseppe M. Bellanca.

"Transoceanic flying can not be a commercial fact until our instruments have been perfected to a degree where such navigation is shorn of its elements of uncertainty. One drifts too easily so far off the course that there is yet no comparison between safe aerial navigation and marine sailings."—Orville Wright.

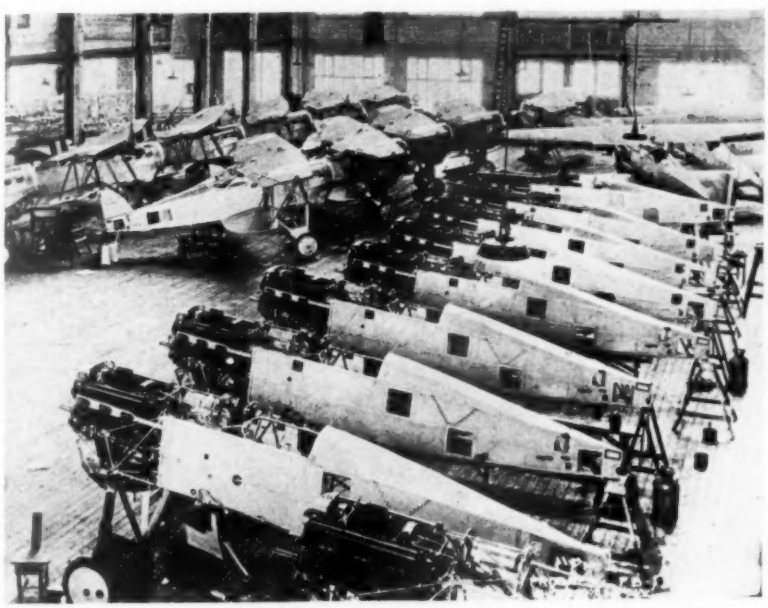
"Chamberlin's flight to Germany, close on the heels of Lindbergh's air journey to France, has demonstrated that the Atlantic can be crossed by airplane without the use of astronomical observations." — Commander Richard E. Byrd.

"Within the next two years there will be more commercial flying in the United States than in all the rest of the world put together."—Charles L. Lawrence, president, Wright Aeronautical Corporation.

"It seems to me that the first development of transatlantic aviation will be the mail service. Think of the vast amount of important mail which now crosses the ocean in six, seven and eight days. Suppose it could be transported in a day and a half. What would that not be worth to business men on two sides of the Atlantic?"—Charles Lindbergh.

A Vision?

For I dipt into the future, far as human eye could see,
Saw the vision of the world, and all the wonders that would be;
Saw the heavens fill with commerce, argosies of magic sails
Pilots of thy purple twilight, dropping down with costly bales;
Heard the heavens filled with shouting, and there rained a ghastly dew,
From the nations' airy navies grappling in the central blue;
Far along the world-wide whisper of the south and rushing warm,
With the standards of the people plunging through the thunderstorm.
—Tennyson, Locksley Hall.



"We have plans for a new airplane which we believe can insure safety in intercontinental traveling." — Charles A. Levine.

"The key to intercontinental flying is simply a better plane. This means more speed and weight capacity in proportion to fuel consumption."—Clarence D. Chamberlin.

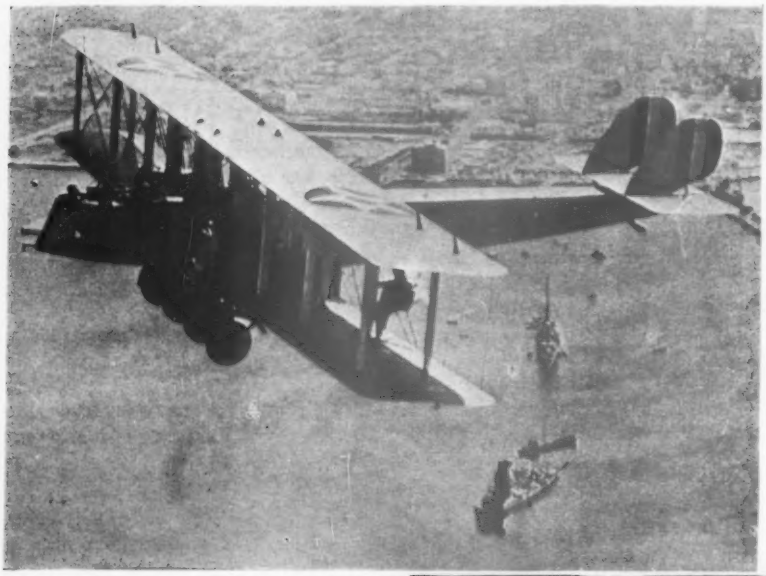
"German aviation interests are contemplating a direct transatlantic air route from Europe to the United States following practically the same route taken by the United States world flyers in 1924."—Vice Consul Ellis A. Johnson, Copenhagen, Denmark.

"The transatlantic flights may be expected to have an immediate and favorable influence on the foreign demand for American aircraft."—H. H. Kelly, automotive trade commissioner, United States Department of Com-

"The time is ripe for serious organization of trans-oceanic aviation lines on the basis of the journey being divided into several laps. It is necessary to split the trip into several laps and to await the construction of a new machine capable of greater mobility with a more limited consumption of gasoline."—Francesco de Pinedo.

"It is not too fantastic to say that in the near future regular transatlantic air service will be developed, for it is now only a problem of suitable planes, because the courage of aviators has already solved the problem of man power. Read, Alcock, Coutenho and Cabrai, Franco, De Barros, Lindbergh, Chamberlin and Levine, and De Pinedo are the pioneers who have opened up the skies to civilization." — Mussolini.

Taking the Jump

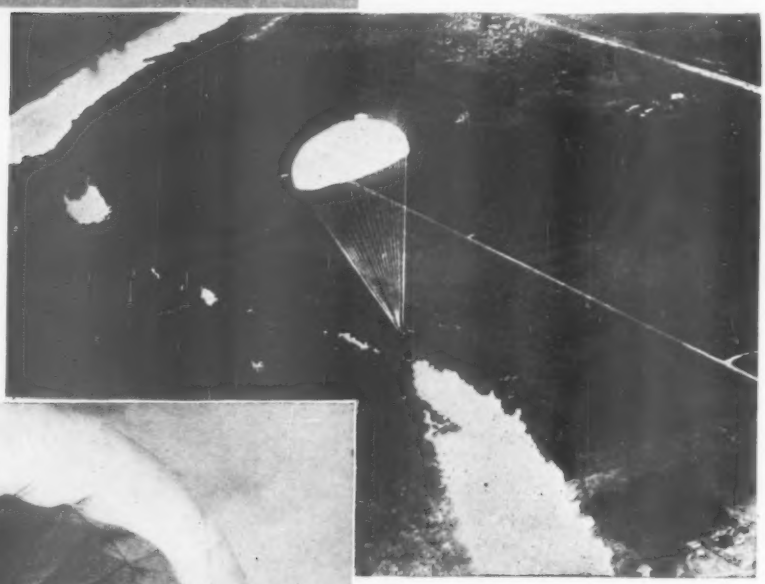


Off!

Sergt. Archie Anderson, U. S. Marine Corps, has just dropped off on his 31st jump at the San Diego Naval Air Station. Private Ferguson is waiting for him to get out of the way so he can jump. The Sergeant fell over 1600 feet before he opened his "chute."

Ready!

Here he is, poised and waiting for the moment to step off into space with nothing under him but a few thousand feet of air.



Slowing Down

The parachute has opened up and caught the wind, easing the jumper down.

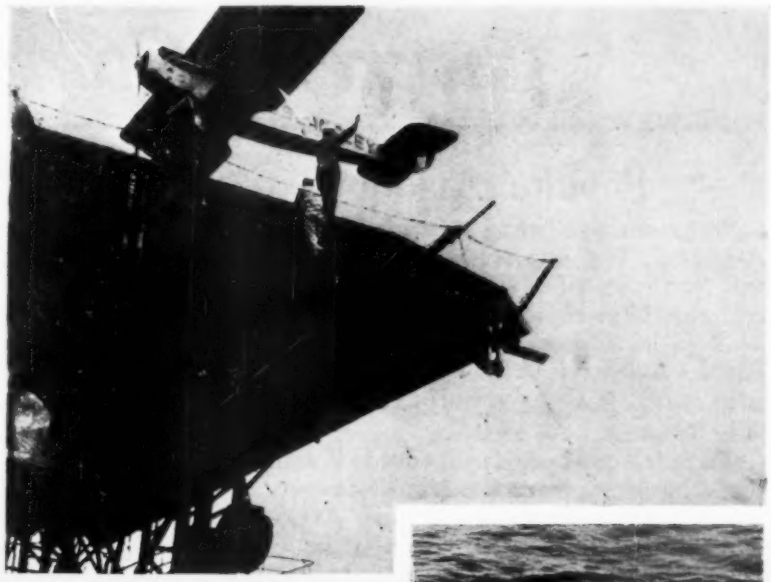
Safe!

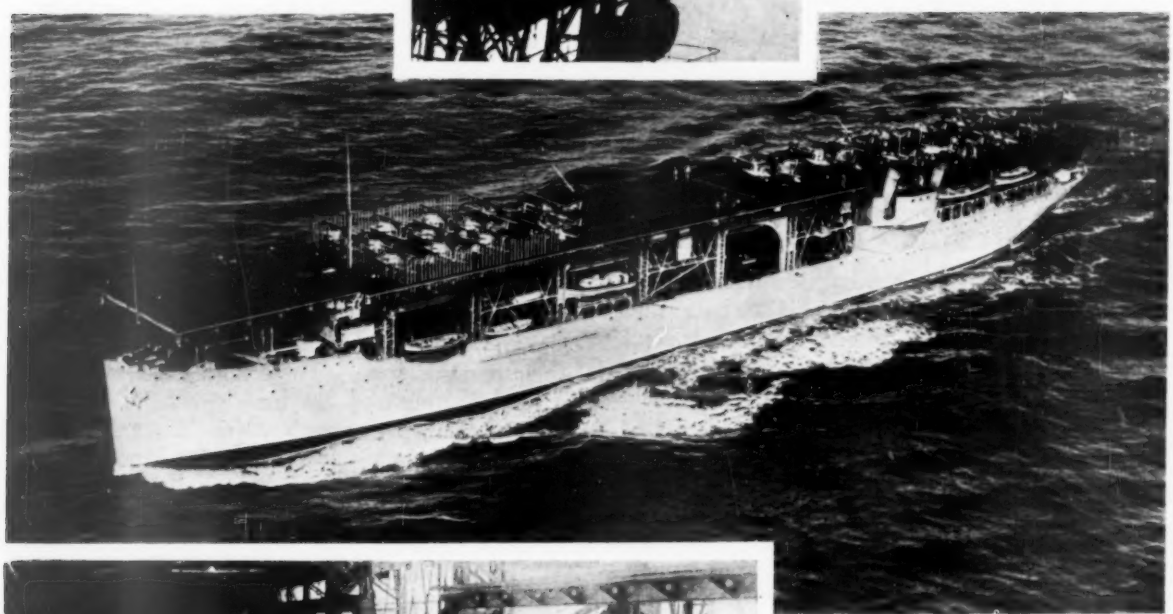
(At the left) M. L. Harrison, of the U. S. Navy holding one of the new parachutes into the wind after a test jump. This parachute is designed so that by pulling a cord attached to the center the jumper can drop like a rock and fall away from a pursuing plane.

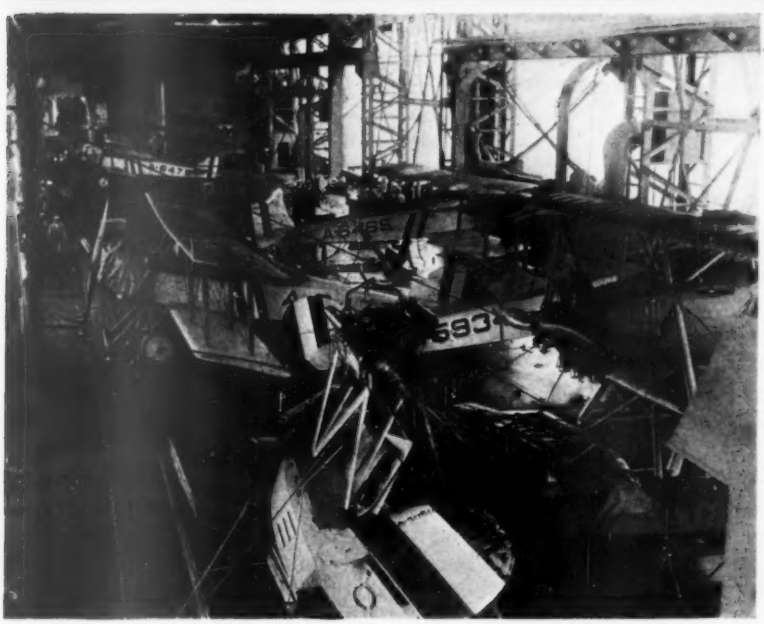
Landing at Sea

One of the most difficult aviation feats is shown in the picture (Acme photos) at the right. A naval plane is landing on the deck of the U. S. S. Aircraft Carrier Langley. The man on the deck is signalling the pilot his level and the distance of the wheels from the deck. Note the net—so the deck men can dodge overboard if necessary.

The pilot must be able to gauge his landing with the greatest accuracy. This requires the highest skill and experience in judging both speed and distance.







The Langley

An unusual photograph (Underwood & Underwood) of the Langley, the mother ship for Uncle Sam's Naval Planes. Twenty-four planes are shown on the landing deck, while many other planes are stowed below.

Below Decks

Under the "Dance Floor" deck of the "Langley" may be seen naval planes in about every possible stage of assembly. The Langley is equipped with every facility for the care and repair of the air scorpions of the navy. Giant elevators take the planes to the flight deck.

Current Comment

Popular Aviation

We mean just what our title says—Popular Aviation. This is a non-technical magazine and will remain so. There are technical journals that deal with the problems of engineering and mechanics involved in mechanical flight, but the mission of Popular Aviation is to bring this great business, art or sport (call it what you will) to the many, instead of to the few.

There is a great popular interest in human flight, that achievement that has caught the imagination of man since the earliest days. Popular Aviation will be glad to hear from the flyers and the would-be flyers. Anything you can do, any suggestions you can offer, that will make Popular Aviation more interesting will be received with more than ordinary consideration.

The Schneider Trophy Races

Past experience has certainly demonstrated that the international races are won by the nation making the most preparation and having the best display of what we call team work. Events of the last races held show that privately financed civilian endeavors are not as successful as when the contestants have the backing of some such highly organized and efficient personnel as that of the Army or Navy.

Teams of foreign nations have achieved their highest efficiency when having either the official or unofficial recognition of one or the other branch of service. Until this fact is recognized here we will probably fail to capture the trophy.

The Flying School

There is but one way to learn to fly—at a regular flying school. Unquestionably there are aviators not connected with flying schools who are competent to teach the mechanical operations involved in flying. But these flyers are not teachers, and they lack one great requisite which makes their instruction faulty and in some cases dangerous.

Competent instructors at regularly established schools are judges of both character and ability. Practice has made them not only perfect in flight and ability to teach flight, but in forestalling mistakes. Given a pupil, one of these teachers will soon detect the faults and correct them, but, what is far more important, will warn the pupil of mistakes he is likely to make. He knows how to anticipate the errors which his judgment tells him a pupil of that certain temperament will make.

Flight schools are safe. Many of them can boast of enviable records free from accident. The courses given are complete, not makeshift, and the investment of the student brings returns in safety and well founded knowledge.

Trans-Oceanic Flights

Frequent expression is heard of the opinion that long and hazardous flights may be individual feats of courage but accomplish little of actual value to mankind.

This attitude represents the viewpoint of the self-called "practical" man, who after all rarely gives the world anything of great or lasting value. We owe so much to our dreamers, to our men of imagination and daring, that it has become commonplace. The steam engine, the electric light, the telephone, the radio and the airplane—all have been stigmatized by these men of affairs as "impractical."

Unfortunately time alone can justify the courage shown by the flyers who braved the unknown air on their perilous trips. These flights may not be immediately followed by the "practical" result of oceanic mail, passenger and freight transportation. But, one result has accrued to the benefit of man.

The possibility of the air trip has been demonstrated, and in such a way that the eyes of the world centered upon the deed. Flying received an amount of publicity in the newspapers and magazines of the world that the entire industry could never have afforded to purchase at space rates.

Mere flight advertising has not been the only result. Thousands upon thousands of people have read with interest and agreed with the words of the flyers themselves as to the need for airports. The possibilities of air transport have been discussed, imaginations have been fired, and thousands of young men have been attracted to a new and coming field of endeavor.

Flying Universities

More rich men with vision are needed to endow aeronautic departments in our universities. The example of Daniel Guggenheim, whose latest benefaction has been dedicated to New York University, can well be followed by others.

The burden of technical research has been borne so far by the government and by private enterprise.

Current Comment

Young men seeking a technical education in aeronautics have been compelled to adopt one or two courses—either to become a sort of hanger-on at some flying field and pick up loose knowledge from willing and experienced men, or to gain their mechanical background in the shops of some manufacturer.

The method has been productive of good men, but it has failed in attracting sufficient numbers of the right sort of material. Endowed aeronautic departments in universities will supply the industry with a quality of intelligent youths who will have the necessary technical education to make their practical training an easy matter.

Wildcat Promotion

"This is an ideal time for wildcat promotion in aviation. There has been too much of it in the past and it is up to each of us to be on the watch for it now," said Col. Charles Lindbergh in one of his New York speeches.

Lindbergh might have had in mind some of the many attempts that are being made to capitalize on his name. Up to this time he has made no connection with any aircraft company and has not made any formal announcement of his intentions. Until such announcement comes from him authoritatively, investors in stock of companies bearing his name, or purporting to do so, should make very careful investigation and know just where they stand.

The Colonel probably meant that the United States is well supplied with men well versed in all matters pertaining to aviation, from designing to navigation, and that the present needs of the country are being taken care of by these established companies. This is a fact. We have sufficient capacity, in brains, capital and equipment. The industry does not need, and does not want, the sort of promotion from which the automobile industry suffered at one of the early stages in its development.

Stimulating Air Commerce

Officials of the Bureau of Aeronautics, Department of Commerce, declare that interest in commercial flying has been stimulated to a new high pitch by the transatlantic flights. Plans for the establishment of new airways and new air ports are pouring in on the department. The Bureau is being literally swamped by inquiries requesting information on its air activities.

One practical means for the stimulation of flying is the air mail. If everyone interested in aviation were to send one additional letter per week by air mail this branch would have to increase its facilities to a very large extent. Contracts for air mail carrying provide the link between government interest and private enterprise. It is only through the development of the air mail service by actual use of its economies in time and money, that commercial aviation can become practically universal.

This does not mean that commercial aviation will not advance independently of the air mail. It will; but the mail service will provide a practically self sustaining network of airways over the country. As conditions warrant passenger and package service will be added.

Give us 20,000 miles of airways—send more letters by air mail.

The Young Flyer

A visitor at the War Show, just held in Chicago, made the remark that he was astonished at the youthfulness of the flying officers. "Boys," he said, "but somehow with a man's look of ability."

Probably that describes the flyers of today with an accuracy that needs no comment. There are plenty of aviators today who are not boys but men who have spent twenty years in amassing the experience that time alone can bring. These men are the backbone of the industry.

However, the future of flying rests with the youth of today. Some young man at present entering on a course of aeronautics in some university may be the inventor of the next great improvement in flight. Some young apprentice at a flying field may be the next man to occupy the limelight of the world through five tangled, hurried weeks.

There is some quality in the youth of this country that gives them the requisites for success in flight. The French laid it to education; the Germans talk of mechanical ability; but it is probably the inherited background of pioneering tradition that seeps through our public schools and imbues our boys with something of the spirit of the men who made the country. Most of what we have can be laid to the adventuresome courage of men who disregarded the known and set forth on journeys into the unknown and uncharted—whether prairie, mountain, the air or the ether.

XUM

The Third National Air Tour

The Third National Air Tour, sponsored by the Detroit Board of Commerce, started June 27 at Detroit and will be the longest course ever attempted in a reliability contest.

The route covers Buffalo, Schenectady, Geneva, N. Y., Boston, New York City, Philadelphia, Pittsburgh, Tulsa, Okla., Omaha, Dayton, Ohio, Grand Rapids, Mich., Cleveland and Battle Creek, Mich. The last lap is from Battle Creek back to the starting point at Detroit. Other cities have requested that the itinerary include them, and some of these may be made intermediate stops. The schedule calls for 16 days of flight, ending at Detroit on July 13.

Over 40 planes have been entered in this contest and practically every plane manufacturer is represented. The advertising value to the winner is of value, as well as the Edsel Ford Reliability Trophy. There is, in addition to the trophy, a number of generous cash prizes.

The smallest craft entered will probably be the Driggs 30-horse power plane, while the largest entry may be the Ford-Stout all-metal monoplane, or one of the giant Fokkers.

The purpose of the reliability tour, which will cover 3,800 miles, is to demonstrate to the people of the country the progress made in aircraft. It will be a convincing proof that commercial flying has reached a point of reliability not realized by the man in the street.

In 1925 the Detroit Aviation Society, with the aid of the National Aeronautical Association, organized the first Intercity Airplane Tour. Eighteen planes left Detroit September 28, 1925, and covered 2,000 miles in seven days, stopping at 13 cities. Sixteen of the planes finished the trip.

In 1926 the same society announced another tour, and 27 planes left Detroit on August 7, 1926, for a 2,500-mile tour, visiting 16 cities. Two weeks later 20 planes completed the schedule. A system for grading the performance has been worked out and will be applied to the 1927 flight.

Walter Beach in his "Flying Showcase" which won the 1926 tour.

The 1926 first place went to the "Flying Showcase," used by the Pioneer Instrument Company, and manufactured by the Travel Air Company. Walter Beach was the pilot.

The wonderful flight of Lindbergh, and the growing appreciation of the public of the regularity of the air mail service will probably attract even more attention to the National Air Tour this year.

National Air Races

The National Aeronautic Association has announced that the national air races for 1927 will be held at Spokane, Wash., September 23 and 24.

In connection with the races at Spokane, races to the field in that city will be held from New York and San Francisco. The race from New York to Spokane will start September 19, and that from San Francisco will start September 21. Stops will be required in the race, as the purpose is the promotion of actual commercial traffic.

Five minute stops are required at Chicago, Fargo, N. D., Glendive and Butte, Mont. An all night stop will be enforced at St. Paul. After stopping the planes will continue in the same order, and at the same interval prevailing when landing. In this way the leaders will not sacrifice their advantage on account of the all night stop.

The selection of Spokane as the city for the annual races is due to the efforts of Harlan Peyton, president of the Spokane chapter of the National Aeronautical Association, and Major John Fancher, commandant of the Fourth Air Service Division, Washington National Guard. There will be both military and civilian races, the former for national trophies and the latter for money prizes aggregating $40,000.

Classification A, for ships of 100 horsepower or under, provides $5,000 for the first prize for the race from New York, $3,000 for second, $1,000 for third, $500 for fourth and $250 for fifth place.

In the B class, for planes of greater than 100 horsepower the prizes are: $10,000 for first, $5,000 for second, $2,000 for third, $1,000 for fourth and $500 for fifth. The only requirement is that the craft be in commercial production for commercial use.

For the San Francisco race the Class A prize will be $1,000, $500, $250, $150 and $100 for the first five places; and for Class B, $1,500 for first, $1,000 for second and $500 for third.

It is expected that the events at the race meet will be as follows:

Free-for-all, civilians only, for planes

(Continued on Page 45)

Famous Flights

The first of a series of articles recounting the stories of famous flights.

The World Flyers at Sitka, Alaska, with the entire fleet together.

P+A PHOTO

Around the World

Probably the greatest distance flight ever made—the Round-the-World Trip of the United States Army. It definitely called the world's attention to American aviation progress.

THE year 1924 saw six nations entered into the race to be the first to circumnavigate the globe by air.

France, Italy, Portugal, Argentina and Britain planned attempts which ended in failure, but the expedition of the United States Army added another thrilling chapter to the history of aviation.

Flying had reached a stage of development in both planes and motors where the attempt was considered practicable by those who had made a study of the exacting conditions under which such a flight had to be made.

The Atlantic had been spanned, in single flight at its narrowest points and in stages; but the Pacific presented a problem that required solution. Only in the high latitudes of the Aleutian Islands could the ocean be crossed, and that region presented great obstacles in the form of severe cold and almost continuous fogs for the greater part of the year.

It was only through the great organization work of the Army that the flight was made possible. The carefully planned route, which was the result of months of study of prevailing winds, weather conditions and topography, was divided into seven sections, each being intrusted to an officer who arranged for stores depots, stocks of spare and repair parts, tools and equipment. He was responsible for providing all accommodations at the landing points, the laying of mooring buoys in harbors and for preparations to take care of emergencies of every description.

The wholehearted co-operation of the United States Navy was secured, and to their assistance must be ascribed no small part of the success of the great project.

The hard and comprehensive preparatory work done by these seven advance officers and their staffs was probably the greatest contributing factor in this conquest of the airway around the world.

Donald Douglas of Santa Monica, Calif., designed and built the four machines used in the flight. The craft approved by the Army was a two-seater biplane of 50 foot span, with an interchangeable undergear, wheels for ground landing and pontoons for sea landing. The planes when fully loaded with fuel and supplies and the crew of two weighed slightly over 4 tons. The motive power was supplied by a standard 450 horsepower, 12 cylinder Liberty motor.

The test machine was given rigorous trials at Dayton, Ohio, and again at Hampton Roads, Va., where its seaworthy powers were tried out. When certain modifications were decided upon and approved by the engineers in charge, Douglas was given the contract for the construction of four machines, which were named after four of our great cities—Seattle, New Orleans, Boston and Chicago.

The four officers selected to pilot

Officers attending daily classes in preparation (left to right) Lieuts. Nelson, Wade and Schultz, Major Martin, Lieuts. Smith and Arnold.

the planes on this epoch making flight were Major Frederick L. Martin and Lieutenants Erik H. Nelson, Leigh Wade and Lowell H. Smith, with Major Martin in command.

The route selected began at Seattle, Wash., followed the west coast north to Alaska, across the Aleutian Islands, Kamchatka and the Kuriles to Japan. From Japan the jumps were to be to Shanghai, Annam, Saigon, Burma and India. From India the route was to follow the established British routes through Europe to England, and from thence across the Atlantic by way of the Orkneys to Iceland, from there to Greenland, and making the final Atlantic jump from Greenland to Labrador. The last sea lap of the journey followed the east coast to Boston and then the last lap of the journey was over land to the original starting point —Seattle.

On April 6, 1924, the Seattle, with Major Martin and Sergeant Alva Harvey, the New Orleans with Lieutenants Erik A. Nelson and John Harding, and the Chicago with Lieutenants Lowell E. Smith and Leslie P. Arnold took off from the bay at Seattle, followed shortly by the Boston with Lieutenants Leigh Wade and Henry H. Ogden. The Boston was overloaded and experienced some difficulty in taking off and had to be lightened.

Battling fog, sleet, snow and hard headwinds, they reached Prince Rupert, the first landing place, late the same afternoon. The Seattle was damaged in landing and repairs occupied the next two days.

On April 10 the four planes took off for Sitka, 300 miles to the north, over a route made dangerous by fog. Held at Sitka by storms, they did not resume their journey for Seward until the 13th.

On April 15 the Seattle was lost sight of by its fellow planes on the jump to Chignik. A cracked crankcase compelled Major Martin to land, but fortunately he was able to get behind a sheltering headland and relieve the Seattle of the full blast of the Arctic storm. The other planes were forced to proceed, as their fuel supplies did not permit of any time being spent in hunting the Seattle.

Navy destroyers were sent to locate the Seattle, and when picked up the Major ordered a new engine from the stores depot at Dutch Harbor by radio and instructed the other three planes to proceed to that place and await the Seattle.

The Boston, New Orleans and Chicago reached Dutch Harbor on April 19, and as this was the last important base before the long crossing to Japan, new motors were installed in all the planes to lessen the risk of trouble in the battle with the snow squalls and head winds. Major Martin, after receiving and refitting his new engine, arrived at Chignik on April 25 in extremely bad weather.

Flight was impossible for three days, and the Seattle was forced to ride at moorings in the rough water, where it

The flagship just before taking off on the final test flight.

became coated with hundreds of pounds of frozen spray. This had to be removed before the Seattle could make an attempt to rejoin the other planes at Dutch Harbor. On April 30 the weather moderated sufficiently to warrant an attempt to proceed and started on the trip. Severe snowstorms and a fog caused the pilot to lose his way, and the Seattle crashed into a mountain and was wrecked completely.

Then began a demonstration of courage in the face of disaster such as the world seldom reads about. Two men, with emergency rations only, were stranded in fog in unmapped mountains of a practically uninhabited country. For two days and nights the fog and snow held them prisoners in their wrecked plane. The fog then thinned enough to permit some exploration, and they set out, frequently forced to turn back on account of precipices and insurmountable obstacles. At the end of three days they were fortunate enough to find a cabin and a store of food. Penned in this cabin for two days by a severe blizzard, they were able to regain some of the sleep lost during their wanderings.

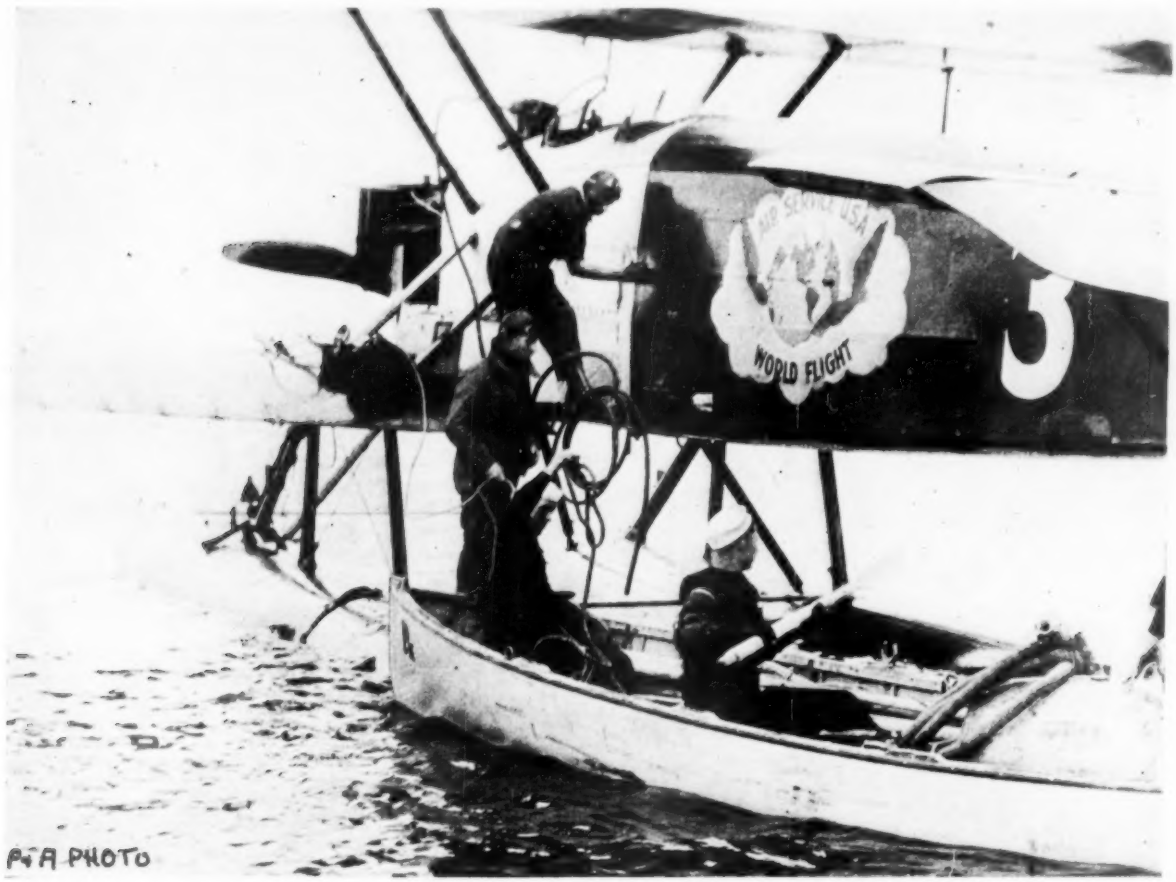
On May 9 they were able to resume their journey and were able to reach salt water at Moller Bay. The following day they reached a salmon cannery at Port Moller, and the anxious world was relieved to hear of their safety.

In the meantime an official order appointed Lieut. Lowell Smith as commander of the expedition and instructed him to start for Japan. On May 2 the Chicago and the other two planes left for Atka, an island 400 miles west of Dutch Harbor. Atka was reached without mishap, but they were forced to remain there on account of storms until May 9. On that day they heard, by radio, the news that Major Martin and Sergeant Harvey had reached safety.

The next step of the journey was along Russian territory, and the Soviet government had withheld permission for the flyers to alight in Russian waters. On reaching Copper Island May 15, in the Komandorski group of islands, the planes were forced to alight outside the three-mile limit close to the U. S. Eider. The following day they were notified that no landing would be allowed, so the flyers hopped off for Paramushiri, in the Kuriles, nearly 600 miles distant. Barring a great deal of trouble with snow and icy rain, the three planes reached Kashiwabara Bay safely and so completed the first crossing of the Pacific in the air.

Tokio was reached May 24 and a remarkable welcome was staged for them by Japanese officials and the American colony. Both engines and pontoons were changed for the flight to Shanghai, where they landed June 4.

On June 4 the planes flew south to Amoy and passed through the edge of a typhoon before landing at Hongkong. Two days later they left for Haiphong, in Annam, and on June 11 they headed for Tourane. On this flight the Chicago developed engine trouble, cracking a cylinder jacket, which compelled



Bluejackets from the U. S. Richmond refueling the "Boston" at Scapa Flow, Scotland, before hop-off for Iceland.

a landing in a nearby lagoon. The two other planes set off for Tourane and sent a new engine to the Chicago on a destroyer. Lieutenant Nelson went back and located the Chicago, which was towed along waterways to Hue, where the new engine was installed. On June 15 the Chicago was able to proceed and rejoin the others at Tourane.

Jumps were then made without mishap to Saigon, Bangkok, Rangoon and Akyab, and from there to Calcutta. At Calcutta the pontoons were replaced with wheeled landing gear. On the way to Karachi the engine of the New Orleans developed serious trouble, so all three were remotored at Karachi.

The flyers reached Bandar Abbas on June 7, Bagdad the following day, Aleppo on July 9 and Constantinople on the 10th. They remained a day at Constantinople and then proceeded to Bucharest on the 12th, Vienna on the 13th and reached Paris on July 14. Here another official reception was held and a day off was taken, and then the flyers left for the Channel hop to Croydon, England's great airport.

The following day the planes were flown to Brough, where the machines were overhauled and the pontoons again fitted for the Atlantic crossing.

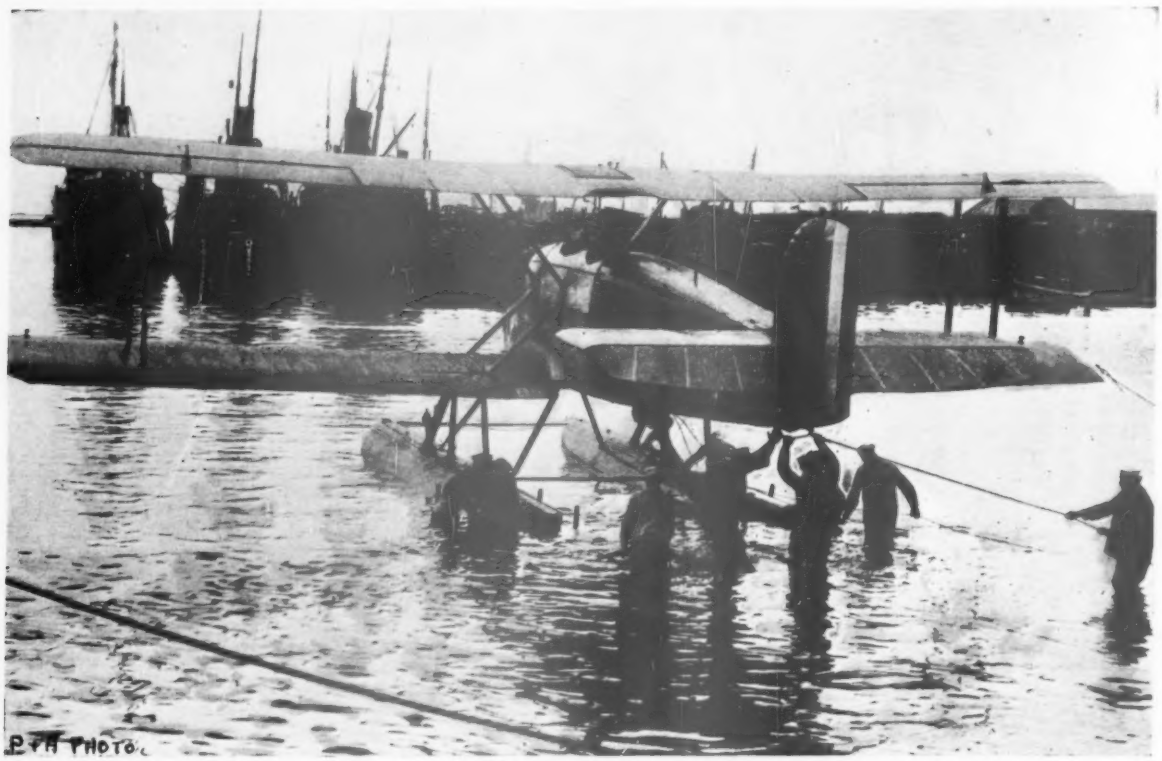
On July 30 the party flew to Kirkwall, in the Orkney Islands, where a fog delayed them two days; but on August 2 a start was made for Hornafjord, in Iceland. In a fog bank the Boston and the Chicago lost sight of the New Orleans, and returned to Kirkwall to await news of it. That evening the radio announced the safe arrival of Lieutenants Nelson and Harding at Hornafjord, where they had a narrow escape from crashing in the fog.

The next day the Chicago and Boston made another start for Iceland, but the Boston's oil pump developed trouble and it was compelled to make a sea landing. Lieutenant Wade waved on the Chicago, which proceeded north and notified the U. S. Destroyer Billingsby of the plight of the Boston. With the cruiser Richmond a search was made for the Boston, but in the meantime it had been picked up by a fishing trawler. High seas made it impossible to tow the plane to the Faroes, and in attempting to lift it on board the Richmond the Boston received severe battering. During the night the plane sank, about a mile from shore.

The Chicago and the New Orleans left for Reykjavik, the capital of Iceland, on August 5, where they were delayed for sixteen days awaiting the establishment of depots on Greenland. The original route contempalted a 500-mile trip from Iceland to the nearest point of Greenland and a second hop of the same distance to Ivigtut, on the west coast of Greenland. Weather conditions made the establishment of a depot on the east coast of Greenland, the first stop, an impossibility, and it was decided to make Fredericksdahl, at the southern end of Greenland, a supply base. This meant that the flyers would have to make an 830-mile jump instead of a 500-mile one.

On August 17 the Italian flyer Locatelli, with three companions, arrived at Reykjavik in his sea monoplane. He was also engaged in an attempt to fly around the world and was invited to accompany the Army flyers and make use of their facilities.

August 21 the Chicago and the New Orleans, with Locatelli, left for Greenland. Locatelli soon outdistanced the two Army ships, but 500 miles out a thick fog was encountered. The fog



The "New Orleans" being hauled ashore at Rekjavik, Iceland, for overhauling before the Greenland trip.

The World Fliers at London's airport, located at Croydon, England.

forced the flyers to descend close to the water, and the dangers of striking the many icebergs that dot the seas for a hundred miles about Greenland were very great. Eleven hours after leaving Iceland the Chicago arrived at Fredericksdahl in the fog, followed shortly by the New Orleans.

Locatelli had not arrived, and warships were sent in search of him, and after a three-day hunt he was found by the Richmond. He had alighted on account of the fog and danger from icebergs and had been unable to rise again owing to engine trouble. Heavy seas had badly damaged his monoplane, so that it was scuttled after the crew had been rescued.

On August 24 the Boston and Chicago reached Ivigtut, where new engines were installed for the flight to Labrador. On the 31st they left for Icy Tickle, Labrador, and the Chicago barely missed falling out of the race. Both fuel pumps stopped working and the reserve tank, fed by gravity, did not contain enough fuel to make the balance of the 560-mile journey. For three hours Lieutenant Arnold pumped on a small hand pump to keep the reserve tank filled, and so the Chicago was enabled to finish the last Atlantic jump.

From Icy Tickle, where the airmen were met by representatives of the press and a message of congratulation from the President, they took off for Boston, which they made in four jumps, to Hawkes Bay, Newfoundland, to Pictou, Nova Scotia, to Casco Bay in Maine, and thence to Boston. At Pictou they were joined by Lieutenants Wade and Ogden in a new "Boston II," which had been brought to that point so that these men could finish with their comrades.

The cross country trip from Boston to Seattle, passing through New York, Washington, Dayton, Chicago, Muskogee, Dallas, El Paso, San Diego, Los Angeles, San Francisco and Eugene, was a triumph, and one reception after another followed at every stop. The journey closed at Seattle on September 28, 1924, just 175 days after the start had been made. Of that time only 15 days, 3 hours and 7 minutes had been spent in the actual flight.

The unstinted praise given these men by the entire country and the recognition of their feat by the world at large was well deserved, and no later feats can ever rob them of their measure of glory and their place in aviation history.

America at Last

The "Boston" and "Chicago" reaching Icy Tickle, Labrador.

Students in the Aeronautic College of New York University are given practical instruction in everything pertaining to the mechanics of flight. Army officers assist the regular college faculty.

The Flying University

By Lowell P. Adams

Many young men are anxious to know where they can obtain an engineering course that will fit them for aviation. This article tells how aviation is gaining a foothold in our colleges.

"THE future of aviation is in the hands of the youth of this country," said Daniel Guggenheim, in presenting the new half-million dollar building of the Guggenheim School of Aeronautics to New York University.

Through his son, Harry Guggenheim, an aviator in France during the World War, the well known millionaire became interested in aviation. Mr. Guggenheim noted that in previous years science and engineering had devoted more time to proving the impossibility of flight than in fostering it.

The various experimenters owed more to their own trials and failures than to the help given by scientific men. The bequests of Mr. Guggenheim have made it possible for aeronautics to be made a part of the regular engineering curriculum, and at New York University the enrollment is more than twice what it is in any other engineering department.

There are four other universities where chairs, or departments, of aeronautics have been established. This makes a total of over twenty colleges and universities where special courses in aeronautics may be elected by engineering students.

Senior students at New York University study aerodynamics, airplane design, and work in the wind tunnel with small models in order to study the behavior and strength of planes and plane sections in the air.

With the aid of the Government the War Department established an Air Unit at New York University so that the training of these college men is not all theoretical. The first two years of the men are spent in the R. O. T. C. Upon approval they may enroll in the aviation unit.

Here they obtain instruction in both theory and practice. The course covers airplane motors, airplane rigging, gunnery, instruments, meteorology, aerial navigation and tactical observation.

Six weeks of the summer vacation during the students' junior year are spent in camp at an army flying field under active supervision of army officers. The cadets are given actual field instruction and then become eligible for commission as second lieutenants in the air service.

This active co-operation between the government and the university is rapidly building up a corps of reserve officers as a part of our national defense.

At New York University Professor Alexander Klemin holds the chair of aeronautics. He has complete charge of this department and all its activities. At present the School of Aeronautics has an enrollment of forty-five students, but the next year's enrollment shows a larger number than that of any other engineering department of the university.

The new building, donated by Mr. Guggenheim, contains a complete laboratory for air experiments includ-

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ing a wind tunnel 110 feet long and 55 feet wide. An eight-bladed aluminum propeller, 14 feet in diameter, whirled by a 300-horse power motor, can produce a current of air in this tunnel with a velocity of 100 miles per hour.

The fund donated by Mr. Guggenheim is in charge of a group of trustees, known as the Guggenheim Foundation, and the trustees have made grants, under the terms of the trust establishing this fund, to other colleges and universities that wish to establish aeronautical departments.

Grants have been made to the Massachusetts Institute of Technology, the University of Michigan, Leland Stanford, Junior, University, and the California Institute of Technology to assist them in creating aeronautical centers.

"Since my first interest in this School of Aeronautics my thoughts have been largely devoted to this subject," said Mr. Guggenheim, "and I have become tremendously and enthusiastically interested in present day developments and their far-reaching effects.

"There has never been a scintilla of doubt in my mind as to the future possibilities and even probabilities for the achievement of aviation, and the marvelous flight recently made by Colonel Lindbergh should remove beyond question of preadventure any pessimistic tendency on the subject.

"Frequently I am asked by young men who wish to take up the science of aeronautics what their chances are of securing positions after graduation.

"It is my belief that any youth who pursues a scientific course and is capable enough to complete it, leading to a degree of an aeronautical engineer, should find little difficulty in securing his place in the industry.

"I look on Colonel Lindbergh as a fair example of what a young man of ambition, determination, resourcefulness and skill is able to accomplish."

Tests are given to determine the fitness of the student to fly by determining his reactions under flight conditions.

Berlin to San Francisco

The Berliner Tageblatt states that Herr Koennecke, the most famous pilot of the Lufthansa (The Aerial Commerce Company) is planning a flight from Berlin to San Francisco and will start some time in July.

A twelve-passenger plane is being reconstructed for this flight. As Herr Koennecke will carry with him a wireless expert and two passengers, the extra space is being remodeled to provide more gasoline storage and a space for wireless equipment.

The plane is a triple-motored craft, two of the motors being Wright air-cooled engines. It will carry enough gasoline and oil for seventy hours of flight. It is planned to use the southern route, over the Azores, the practicability of which has been tested before.

The two passengers are to be the financial backers of Koennecke, who are brothers.

Student flyer ready to take off at flying field of New York University.

Science and Invention

Sea Landing Fields

Transatlantic flights have brought forward innumerable suggestions as to seadromes, but interest seems to center on the one shown in the above photograph.

It is proposed that these huge landing places be anchored in the ocean at intervals of, say, 400 or 500 miles, and that accommodations be provided on them for everything requisite for the comfort of passengers and pilots and for the care of planes. The model shows a wireless station, quarters for pilots, dining room and hotel accommodations for passengers, and repair shops and storerooms for spare parts.

The device, which is the idea of Howard R. Armstrong, of Holly Oak, Del., consists of a series of cylindrical steel buoys, which are held in position by a framework of structural steel. The whole supports a platform of sufficient width so that several planes may be accommodated side by side, and of great enough length so that landings and take-offs can be made with absolute safety.

The seadrome platform would be raised sufficiently above the level of the waves so that the platform would be protected. Mr. Armstrong is head of the mechanical experiment department of the du Pont Company, in Wilmington, Del., and expects that construction of the first unit will be started within a short time. The cost of the first unit of the Armstrong Seadrome is expected to be between $50,000 and $100,000.

Sketched Model of the Armstrong Seadrome as it would appear in use.

Duplicates Air Conditions

In order to make accurate tests of the many instruments required for research work in the air, and to establish standards for the ordinary navigation instruments used by aviators, the Bureau of Standards at Washington, D. C., has devised a testing tank which duplicates the conditions found in the upper air.

This testing tank resembles a huge safe, has room in it for two men, and provides facilities for the observation of the instruments that are to undergo the tests. Piping and control valves permit the application of additional air pressure or the gradual diminution of it, so that the changing conditions found in the air may be duplicated and the effect on the instruments noted. Practically every atmospheric condition can be imitated in this testing tank.

The illustration shows the entrance to the wind tunnel at Washington, which is used by the Bureau of Standards in the many tests that are constantly being made. A large electric motor operates a four bladed propeller which can be run at varying speeds to produce the effect of wind velocity up to 150 miles per hour.

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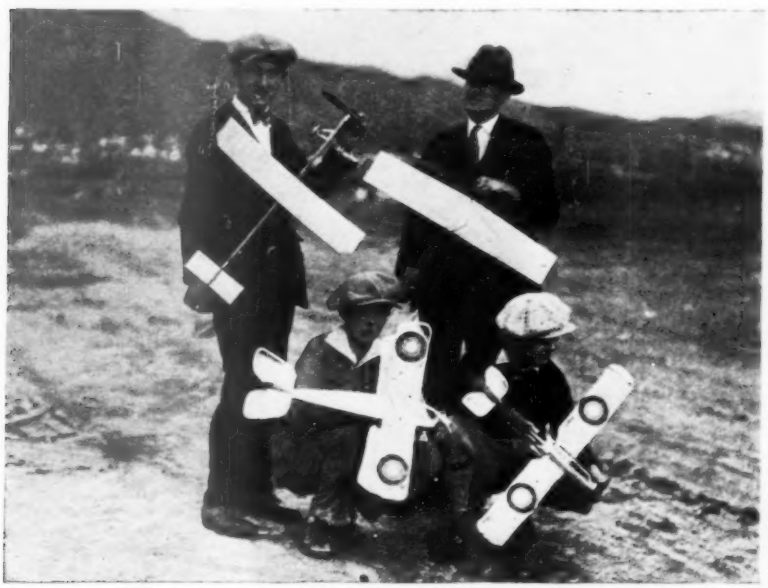
Boys' Model Club

The boys, young and old, around Glendale, California, meet regularly under the promotion of the Southern California Model Air Craft Builders Association. The purpose of the Association is to promote interest in aviation and its activities.

The founder of the club is William E. Bodenlos, the man standing at the right in the picture (Acme photo.) He is holding one of the prize winning models, a miniature plane that



holds a record for over two minutes sustained flight.

The boys who are kneeling are Carlyle Wingett and James Fox, and they are holding models of a DeHaviland and an S. E. 5. Ray Abos, standing is holding one of the prize winners.

Canvas Propellers

The Westinghouse Electric & Manufacturing Company, at East Pittsburgh, Pa., have perfected a process for manufacturing airplane propellers of impregnated canvas. This process, which is, of course, a secret one at the present time, takes a cotton base saturated with some chemical and molds it under tremendous pressure to the required shape. The product is called Micarta.

The company has obtained a contract from the United States Navy Department for 250 propellers made of Micarta. The propellers were put through exhaustive tests by the Navy Department and finally adopted as standard equipment owing to the water-resisting properties of the material. The new type of propeller is tipped along the edges and has the advantage of not warping in storage and being non-corrosive. The lightness of the material is another advantage in its favor. When tipped with bronze or brass it will resist sea spray longer than other types of propellers, a large factor in navy use.

A Giant Propeller

What is probably the largest propeller ever made is shown in the accompanying illustration. It was made by the Huff Daland Airplane Company at Bristol, Pa., for the "Cyclops," a giant experimental plane.

The blade measured 16 feet in length and was made under the supervision of C. T. Porter. It was designed to turn at a speed of about 1,000 revolutions per minute by an 850 horse-power motor.

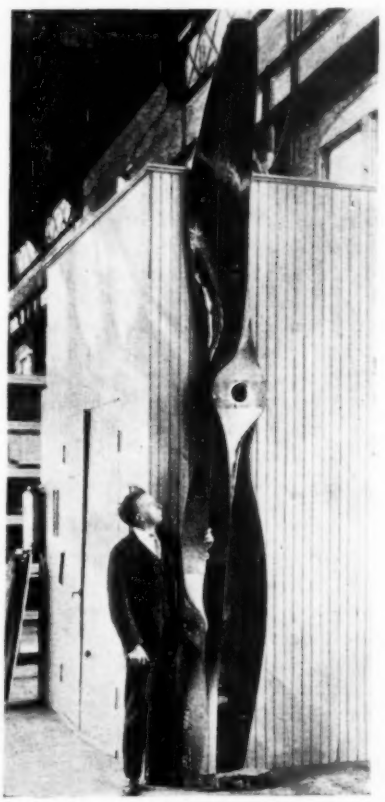
Pigeon Training Plane

Message carrying pigeons are trained in the work expected of them by means of an airplane. Chief Quartermaster Henry Kubec is in charge of the school for training these pigeons, located at Washington, D. C. Birds are taken in crates on board the plane and carried to varying altitudes, sometimes as much as 10,000 feet. They are dropped clear of the propeller and thus allowed to find their way home.

The training progresses by easy stages, flights of from two to four miles being undertaken at first. The pigeons are thus submitted to a natural weeding-out process, and after they are able to make their way back quickly from distances of 25 miles, they are taken out for trips of greater and greater length until they are competent to fly 500 miles at the rate of approximately 60 miles per hour. This last is the goal set for the ideal pigeon messenger, and nearly half of the birds have accomplished this feat.

Ford's New Plane

William B. Mayo, chief engineer for the Ford company, has stated that they are planning the construction of an all metal passenger plane to carry twenty passengers. This is twice as large as the present plane now manufactured by the company, which has a carrying capacity of ten persons.

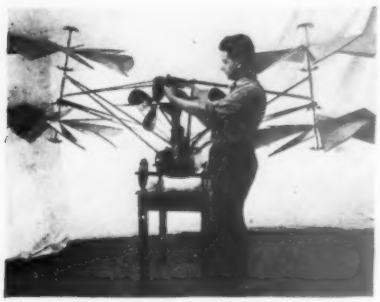


Back Yard Airdromes?

Horizontal flight is an accomplished thing, but little progress has been made with what are called helicopters. A true helicopter, should one ever be built, will be able to rise straight up from the ground and descend vertically.

The possibilities of this type of flight are almost unlimited and anyone can see the enormous advantages of a machine that requires no landing field and that can descend almost anywhere. The scarcity of landing fields, and their distance from large cities will have no bearing on the future popularizing of flying, as any large roof, or open space could be used by a helicopter.

Many inventors have worked for years on a machine to embody these advantages, but with little success. Several helicopters have been built,



many of them working fairly well in model form, but failing in actual flight. The illustration shows the much talked of Cierva Autogiroplane. It was the most successful machine of its type and in the tests at Farmborough, England, it rose from the ground successfully, but crashed later. The pilot escaped unhurt. Little has been heard of helicopters since the failure of the Autogiroplane, but there is no doubt that experimenting is still going on.

It may be that success will attend some inventor's efforts.

Cayley's Helicopter

Eighty years ago Sir George Cayley drew the plans for a helicopter that he thought would fly if properly motored. So many of Cayley's ideas have proved to be correct when viewed in the light of modern science that Paul A. Garber of the National Museum in Washington, built one on Cayley's plans.

The design of the helicopter, which can be seen from the photograph (Underwood & Underwood), is very similar to the designs for helicopters that have been produced during the past ten years.

Protest Plane Sale

Horace G. Knowles, former United States minister to Roumania, has sent a letter of protest to Postmaster-General Harry S. New concerning the sale of 29 Douglas mail planes by the department.

It is the contention of Mr. Knowles that the sale threatens to destroy the air mail organization of the government after a total of more than $15,000,000 has been spent to bring it to an efficient point.

At the present time most of the air transport of mail is in the hands of private companies who handle the traffic under contract with the government.. The government has simply followed the practice of relinquishing its ownership as soon as private enterprise is able to provide transportation that is regular and safe. This encourages commercial development.

Airplane Rescue Sled

So many airplanes undergoing tests at the Naval Air Station at San Diego, Cal., were compelled to land on the mud flats near the Station that a special boat was needed to rescue the stranded planes and crews. The Air Sled designed draws only eight inches and can travel at 30 miles an hour.

Sale of Liberty Motors

The Air Corps of the United States Army has released for sale, under certain restrictions, a number of new Liberty "12," 400 horse power airplane motors.

These motors are stored at present at the Little Rock Air Intermediate Depot, Little Rock, Ark., and will be sold "as is" for $1,000 each, plus a handling charge of $10.

The motors are new and unused, but were manufactured in 1917 and 1918. The government has taken precautions to keep them in the best possible state of preservation, but no guarantee is given that they are in perfect condition.

It is the intention of the Government to offer these motors for use in this country only.

The requirements of the sale are that 20 per cent of the purchase price accompany the order in the form of a certified check, or cash, the balance to be remitted and shipping instructions given within 30 days of the award; that the purchaser must present conclusive evidence that he has a plane, built, or being built, in which to install the motor; that the plane will be used in this country; and that the government may require a bond if necessary to insure the non-export of these engines.

For further information about these Liberty motors address the Chief, Field Service Section, Air Corps, Fairfield, O.

Acme Photo.

How Many Planes?

According to the Department of Commerce, 1,186 airplanes (including seaplanes) were manufactured in 1926. This is an increase over 1925, when only 789 planes were manufactured. The value of the aircraft produced in 1926 has been reported as $20,081,181, as compared with $12,524,719 for 1925. This is an increase of over 60 per cent in value. This figure does not include airplane engines to the value of over $4,000,000 manufactured in 1926.

Sixty-seven manufacturers reported for 1926, including five engine manufacturers. The geographical distribution of the manufacturers is as follows: New York, 16; Michigan, 9; California, 7; Illinois, 5; Ohio, 5; Missouri, 4; Pennsylvania, 4; New Jersey, 3; Connecticut, 2; Kansas, 2; Maryland, 2, and one each in Colorado, Indiana, Iowa, Kentucky, Nebraska, Texas, Washington and Wisconsin.

The year 1927 is expected to show a still larger increase.

Long Distance Camera

The photograph at the left shows a new type aerial camera with a newly developed lens that has a focal length of 36 inches. It will take photos at a height of 30,000 feet and to a distance of 100 to 200 miles.

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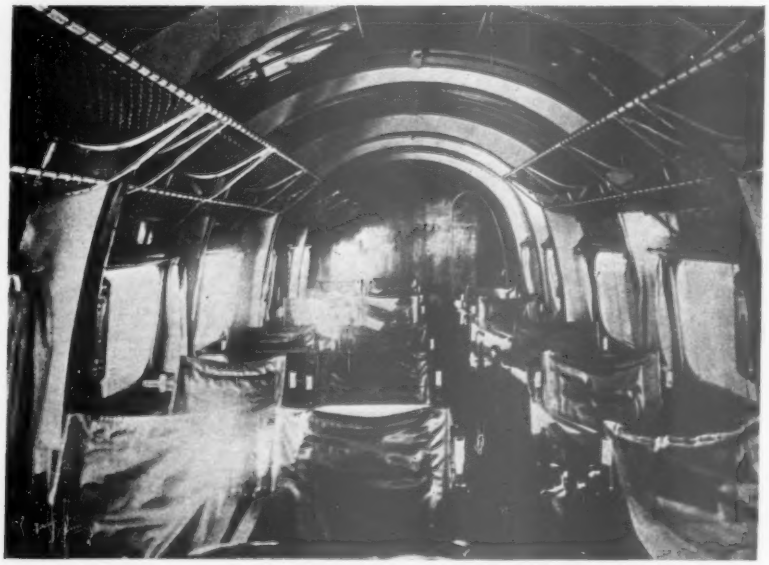
Foreign News and Notes



Interior of Continental Air Liner. Seats like those of automobile busses add to the comfort of passengers.

Educating Air Travellers

Passengers on the Imperial Airways are handed a little folder which gives them information as to airplanes and airplane travel. The purpose of the folder is to answer the many questions asked by the passenger who is traveling by air for the first time and to explain to him the various precautions the company takes for his safety and the means for promoting comfort during the journey.

Some of the hints for the air travelers follow:

Special clothing is not necessary for air travel; clothing suitable for a motor car journey is adequate.

Maps of routes can be obtained free at the various stations before departure.

Do not be concerned if the machine on starting taxies slowly towards a corner of the aerodrome. An aeroplane always starts and lands head against the wind. After a small run the machine almost imperceptibly rises from the ground.

We recommend passengers to place cotton wool in their ears to deaden the noise caused by the engines.

Slight deafness is sometimes caused by atmospheric pressure, and *immediate* relief can be obtained by either just blowing your nose, with the nostrils pinched together, or, when landing, going through the action of swallowing.

In order to turn, an aeroplane banks —one side is raised above the horizontal and the other side lowered. This is a perfectly safe movement.

"Air pockets" do not exist, and when "bumps" occur they are caused by upward and downward currents of air, which have a similar effect upon aeroplanes as waves have on ships.

Dizziness, as experienced by some people when looking down from a high building, is unknown in aeroplanes, as there is no connection with the earth.

Air sickness affects fewer passengers than sea sickness; several of the proprietary remedies are completely efficacious. Cuspidors are provided for the use of passengers. Experienced passengers say that the finest cure for sea sickness is fresh air.

The windows of the cabin can be opened or shut as desired.

All Imperial machines flying on the continental scheduled services have lavatory accommodations at the rear of the cabin, and passengers can freely move about the cabin without affecting the balance of the aeroplane.

Drinking water and glasses are carried on all Imperial aeroplanes.

It is prohibited by government regulations to smoke or light matches in the aeroplanes.

Nothing whatsoever should be thrown out of the windows of the aeroplane.

In the case of necessity, passengers can communicate with the pilot

Despatchers keep in touch with the pilots constantly by means of the radio.

through the aperture in front of the cabin.

Your pilot is in constant touch with his Terminal Aerodrome by means of wireless telephony. He receives reports regarding the weather conditions at frequent intervals, and can ask for any information he needs at any time.

Lifeboats are provided, as on ships, in case of emergency when crossing the Channel.

Put the belt on as you would a waistcoat, by passing the arms through the shoulder-straps so that the brass operating lever comes to the bottom right-hand side. Hook the brass buckles in front.

Hold the air bottle (which will be felt inside the belt) in the left hand and press the operating lever upwards with the right hand. If the cylinder does not work, inflate by mouth, after unscrewing the valve on the left side of the belt. When sufficiently inflated, screw down tightly the mouthpiece

Every aeroplane is fitted with an emergency exit in the roof of the cabin. It is clearly marked as such and will open by pulling the ring attached

Passengers need have no cause for alarm when hearing the engines slowing down: this is only an indication that the pilot is preparing to land, that he wishes to reduce speed, or that he desires to fly at a lower altitude which may, in his opinion be advisable owing to calmer weather or better visibility, etc.

Amazon Valley Service

Unofficial negotiations have been started by the Peruvian government, with the government of Brazil, to secure the co-operation of the two countries in an aerial service that will span the South American continent.

The preliminary negotiations, which will have to include some mapping and other flights, will cost the Peruvian government about $250,000. The attempt, if successful, will open up the vast territory of the Amazon by means of the air.

The new route, if established, will link Lima with Para by means of a four or five day trip. At the present time it takes from five to ten weeks to make the same trip overland.

Only three planes have entered the Amazon Valley. In March, 1927, Commander Francesco de Pinedo made a flight from Manos to Para. In 1924 and 1925 Walter Hinton explored sections of the Amazon and Negro rivers with hydroplanes for the Hamilton Rice Scientific Expedition. In 1922 Elmer Faucett, a civilian flyer from the United States, won the $2,000 prize offered by the Peruvian government for a flight from Lima to Iquitos.

The commander of the Peruvian air forces is Lieut.-Com. Harold B. Grow, of the American naval mission. Another American naval pilot will be in charge of the naval hydroplane base at Iquitos. The rest of the personnel will be Peruvian officers and men trained at the Ancon flying base by officers of the United States naval mission.

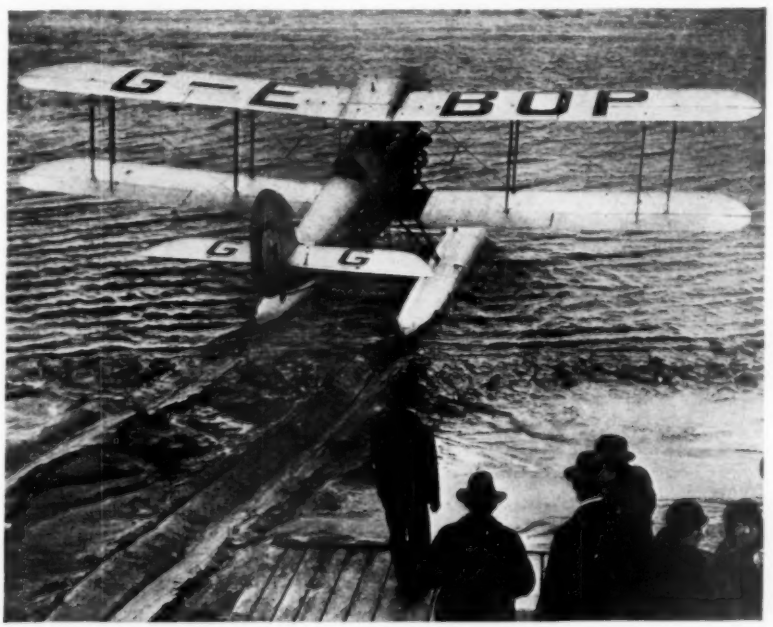
Four hydroplanes will be shipped to Iquitos for the permanent base at that point. Two land planes will be flown from Lima, on their arrival, to San Ramon, on the other side of the Andes in the Chanchamayo valley.

Persia Stops Air Route

The British government has opened negotiations with the Persian government in order to inaugurate the regular air service between Cairo, Egypt, and Kairachi, India, which was recently announced. The Persian government refused permission for the planes to fly over its territory, so the air service had to be abandoned pending the outcome of the negotiation.

German-Persian Airlines

The German Lufthansa (Commercial Airplane Transportation Company) has announced an extension of the Berlin-Moscow air route to Teheran, Persia. Through an agreement with the Russian Air Transit Company and the Persian National Airplane Company, the Persian planes are permitted to fly as far as Baku, on the Black sea.



The first plane to be put in service on the Cairo Air Route.

Passengers leave Berlin at the great Templehofer Airdrome, the flying center of Berlin, and are taken directly to Moscow. At Moscow they change to the Russian line and next alight at Baku, where the Persian liners leave for the final hop to Teheran.

The Lufthansa has also announced the opening of the new Swedish route to Stockholm, by way of Breslau. This represents a large saving in time for commercial travelers, as the new route takes but nine hours. By ship and rail, provided all connections are made on time, the same journey takes nearly 32 hours.

The great Templehofer Airdrome is a star-shaped field, located outside of Berlin, and is well lighted for night landings and take-offs. Enormous lights illuminate the entire field.

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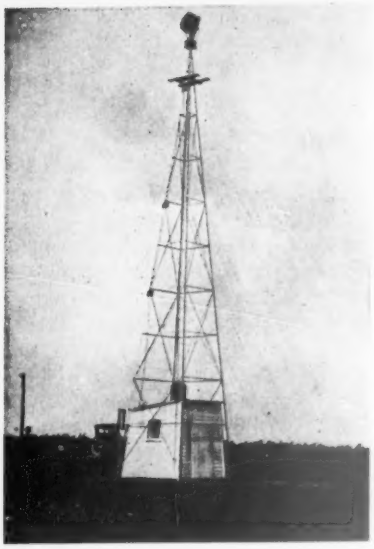
Air Ports



Chicago's New Port

The plea of Col. Lindbergh for more and better landing fields is bearing fruit in one city at least. Here is one actual, beneficial result of this spectacular flight, with which to confront the man who asks what use a daredevil trans-oceanic flight can possibly have in this practical age.

The situation in Chicago is approximately that of other large cities. Chicago has landing fields, but most of them are so situated that it takes an hour's time to reach the central part of the city after landing. One hour wasted at the terminal is the equivalent of a 100-mile journey in the air, and means the waste of that much time saved during the flight itself.

A bill is now before the Illinois legislature which will permit the collection of a half-mill tax for ten years for the construction of a landing field. Another bill permits the South Park Board, in Chicago, to reclaim a landing field from Lake Michigan just south of the Soldiers' Feld.

If both of these bills are passed Chicago will have an airport that can accommodate both ground landing and sea planes. The port will be within a ten-minute ride of the business district, the hotels, and the postoffice.

According to the plans of the present day, the field will not be used for hangars or shop. It will be a station, and after discharging passengers and mail, the planes will be flown to other fields in the suburbs, just as railroads haul their trains to yards after leaving their passengers at terminals.

Recent statistics show that Chicago is one of the greatest airports of the world. If mileage of planes using the city ports is to be considered as a basis of ranking, Chicago leads the world. Chicago is the hub of the air mail system today.

North Carolina Airport

Last month the airport at Greensboro, N. C., was officially opened. Pitcairn Aviation, Inc., of Philadelphia, have the contract for the commercial operation of the field. The same company holds the contract for the air mail service between New York and Atlanta, Ga.; but the mail service will not start for a month or two. The airport will serve the triangle industrial cities of the state, Greensboro, Winston-Salem and High Point.

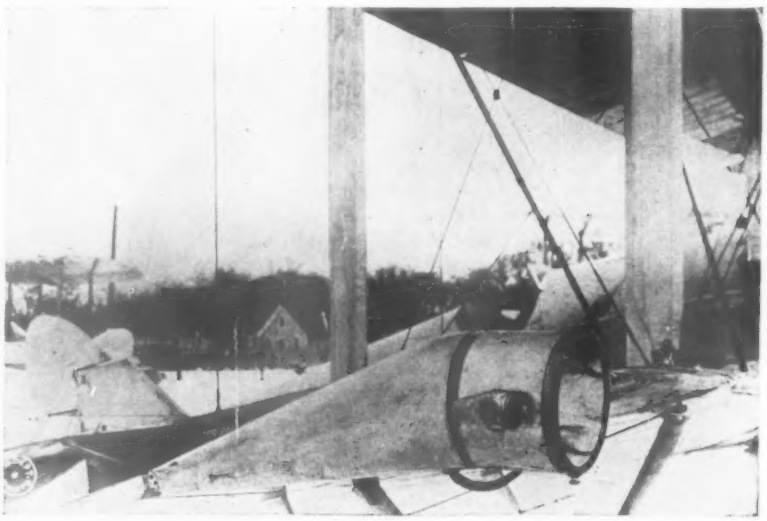
Mountain Sightseeing

The Pacific Air Transport Company, of Portland, Ore., is now operating two cabin planes on their regular mail, passenger and express service between Los Angeles and Seattle.

The rapidly increasing passenger business of the company led it to add a six-passenger Fokker cabin plane to the six-passenger Travel Air monoplane already in operation. The Travel Air is flown on a regular service between Los Angeles and San Francisco.

The air route between California and the Pacific Northwest is considered one of the most beautiful trips that can be taken. In taking this trip the passengers see five famous mountain peaks—Mount Shasta, in California; Mount McLaughlin, Mount Jefferson, Mount Hood and the Three Sisters, in Oregon, and Mount St. Helens, in Washington. The route passes over two famous valleys, that of the Sacramento, in California, and the Willamette, in Oregon.

Wing searchlights to facilitate landing at night by the mail planes.



1,386 Miles of Lights

The aeronautical branch of the Department of Commerce has completed 1,386 miles of lighting along established airways. Forty-five fields have been established, 109 beacons and 73 blinker lights have been erected.

The department is working on other routes so that by the end of the year over 7,000 miles of airways will be lighted for night flying. By that time it is expected that the airway system of the United States will be extended to 9,435 miles and will be serving 82 cities.

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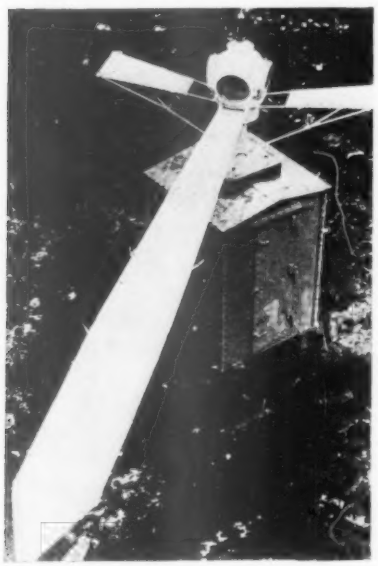
Ohio Express Service

A daily passenger service is in operation between Louisville, Ky., and Cleveland, Ohio, making stops at Cincinnati, Dayton, Columbus and Akron. The service is called the ER Express, so called from the initials of the Embry-Riddle Company which operates it. Passenger and express traffic has been



This is the sort of beacon that guides the pilots of the air mail.

assured the line by many industrial concerns along the route and adequate landing fields are available in every city. The territory traversed is ideal for flight purposes, and the district is practically level and abounds in fields available for emergency landings.

The company is using five pilots at the present but as the service grows in use more will be added.

Cities Get Equipment

The Postmaster General of the United States, Harry S. New, has announced the approval by President Coolidge, and the agreement by Secretary Hoover, of the transfer of equipment at air mail landing fields to the municipalities where the fields are located.

By fall the government will be practically out of the air mail business, as most of the mail routes will then be under contract to private air transport companies and individuals. The lighting equipment of the government fields, and many buildings, will then be turned over by the government to local ownership.

The equipment at Maywood field, near Forest Park, Ill., will be turned over to the city of Chicago in all probability. It consists of buildings, two enormous beacon lights on 36-foot towers, two huge flood lights, a 25-kilowatt generator, and a number of field boundary lights.

Other cities that will receive such equipment are Cleveland, Iowa City, North Platte, Neb., Cheyenne, Wyo., Elko, Nev., and Salt Lake City.

Orville Wright Honored

The Wright Brothers and Charles Lindbergh were honored at the fifty-seventh annual meeting of the Western Society Engineers at the Palmer House, Chicago, June 1.

The annual award for outstanding engineering accomplishment which is

known as the Washington Aviation Award, was given to Orville Wright by Paul Westburgh, representing five leading engineering societies.

In accepting the award Mr. Wright pointed out that it was because his brother, in addressing the Western Society of Engineers in 1900, became aware of the fallacy of an accepted engineering fact that the first airplane was developed and flown on December 17, 1903.

National Air Races

(*Continued from Page* 30)

with piston displacement of 800 cubic inches; prizes $2,500.

National Guard race; prizes $1,000.

Light commercial planes, civilians only, speed and efficiency ratings; prizes $2,500 and trophy of Aviation Town and Country Club, Detroit.

Trophy race, civilians, planes of 510 cubic inches of displacement; prizes $2,000.

Large capacity military planes; prizes, trophies.

Military observation plane race; prize, Liberty engine builders trophy.

Pursuit type plane race; prize, John L. Mitchell trophy.

Air transport speed and efficiency races, civilians; prizes, $2,500 and Detroit News trophy.

Pursuit race, military; prize, Kansas City Rotary Club trophy.

Gliders and Motorless Planes

(*Continued from Page* 22)

ease in alighting and taking off—another distinct advance in the science. At the time of his death he was working, like Lilienthal, on an engined biplane.

Octave Chanute, a Chicagoan, had become interested in Lilienthal's experiments, and with the aid of A. M. Herring, a pupil of Lilienthal, he made many tests. Their greatest success was with a tailed biplane. Chanute's machines were more stable, more easily managed and much more rugged than those of his predecessors.

It was Chanute's type of glider that the Wright brothers modified in their experiments which resulted on December 17, 1903, in the first practicable human flight.

Radio Communication

(*Continued from Page* 24)

pany. Dr. Burgess, head of the Bureau of Standards, was seated at his office desk and Mr. Stout was in the plane. After an explanation of the purpose of the experiment and a short talk on the work of the Government in aiding development of commercial aviation, the telephone operator in Washington plugged in the connections that enabled listeners at radios to hear the two-way conversation of both men.

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A Dictionary of Aviation

Save this copy of Popular Aviation for this article alone. Many of the words defined in this list are not to be found in ordinary reference works without a search. Here is a quick reference way—Save your copies of Popular Aviation.

AEROFOIL:
A winglike structure, flat or curved, designed to obtain reaction upon its surface from the air through which it moves.

AEROPLANE:
The term AIRPLANE is preferred.

AILERON:
Movable auxiliary surface used to obtain rolling movement about the fore-and-aft axis.

AIRCRAFT:
Any form of craft designed for the navigation of the air—airplanes, balloons, dirigibles, helicopters, ornithopters, gliders, kites, etc.

AIRPLANE:
A form of aircraft heavier than air, which has wing surfaces for support in the air, stabilizing surfaces, rudders, and power plant. Used in a more restricted sense to differentiate from SEAPLANE.

AIR-SPEED METER:
Instrument designed to measure speed of craft with reference to air.

ALTIMETER:
Aneroid mounted on aircraft to indicate its height above sea level.

ANEMOMETER:
Instrument for measuring wind velocity.

ANGLE:
Of attack; of incidence—the acute angle between the direction of the wind and the chord of an aerofoil. The angle between the chord of an aerofoil and its motion relative to the air.

Critical—The angle of attack at which the lift curve has its first maximum. (Sometimes called the "burble-point.")

Gliding—The angle the flight path makes with the horizontal when flying in still air without power.

APPENDIX:
The hose at the bottom of a balloon used for inflating.

ASPECT RATIO:
The ratio of the span to the chord of an aerofoil.

AVIATOR:
Operator (regardless of sex) of any heavier-than-air craft.

AXES:
Three fixed lines of reference in aircraft.

Fore-and-aft (longitudinal) axis is in the center, usually parallel with the propeller shaft. This axis, drawn from front to rear is called the X axis.

Vertical axis—perpendicular to the longitudinal axis, and like it, in the plane of symmetry. Called the Z axis.

Transverse (or lateral) axis—Perpendicular to the other two. Called the Y axis.

BALLOON:
A form of aircraft consisting of a gas bag and a basket. The support in the air results from the buoyancy of the air displaced by the gas bag, the form of which is maintained by the pressure of a gas lighter than air.

Captive—A balloon restrained from free flight by a cable.

Kite—An elongated captive balloon fitted with tail appendages to keep it headed into the wind.

Pilot—A small spherical balloon sent up to show wind direction.

Sounding—A small spherical balloon sent aloft, without passengers, with registering meteorological instruments.

BALLOON BED:
A ground mooring place for captive balloon.

BALLOON CLOTH:
Fabric, usually cotton, of which balloon bags are made.

BALLOON FABRIC:
The finished material, usually rubberized, of which balloon envelope is made.

BALLOONET:
A small balloon within the interior of a balloon or dirigible for the purpose of controlling ascent or descent and for maintaining pressure on outer envelope to prevent deformation. The balloonet is kept inflated at the required pressure under control of a blower and valves.

BANK:
To incline an airplane laterally—to roll it about the fore-and-aft axis. Right bank is to incline the airplane with the right wing down. Used as noun to describe position of airplane when its lateral axis is inclined to the horizontal.

BAROGRAPH: Instrument for recording variations in barometric pressure. Records show altitudes rather than pressures.

BASKET:
The car suspended beneath a balloon.

BIPLANE:
A form of airplane in which the supporting surface is divided into two parts, one above the other.

BODY:
(Of an airplane.) The structure containing power plant, fuel, passengers, etc.

BONNET:
The appliance, like an umbrella,

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protecting the valve of a spherical balloon.

BRIDLE:
The system of attachment of cable to a balloon.

BULL'S-EYES:
Rings of wood or metal in balloon rigging for connection of ropes.

BURBLE-POINT:
See Angle, Critical.

CABANE:
A pyramidal frame work on the wing of an airplane to which stays, etc., are secured.

CAMBER:
The convexity or rise of the curve of an aerofoil from its chord, usually expressed as the ratio of the maximum departure of the curve from the chord to the length of the chord.
"*Top camber*" refers to the top surface of an aerofoil, "*bottom camber*" refers to the bottom surface, while "*mean camber*" is the mean or average of these two.

CAPACITY:
See Load.

CENTER:
Of pressure of aerofoil—The point in the plane of the chords of an aerofoil (prolonged if necessary) through which at any given attitude the line of action of the resultant air force passes.

CHORD:
Of an aerofoil section—a right line tangent at the front and rear to the undercurve of an aerofoil section.
Length—The length of the chord is the length of the projection of the aerofoil section on the chord.

CLINOMETER:
See Inclinometer.

CONCENTRATION RING:
Hoop to which are attached ropes suspending basket of balloon.

CONTROL COLUMN:
The vertical lever (stick) by means of which principal controls are operated—those for pitching and rolling.

CONTROLS:
A term applied to the means provided for operating devices used to control speed direction and altitude of aircraft.

CROW'S FOOT:
Diverging short ropes for distributing pull of a single rope.

DECALAGE:
The angle between the chords of the principal and the tail planes of a monoplane. Also applied to the corresponding angle between the direction of the chord or chords of a biplane and the direction of a tail plane. Sometimes called the *longitudinal V* of the two planes.

DIHEDRAL:
The angle included at the intersection of the imaginary surfaces containing the chords of the right and left wings. The angle is measured in a plane perpendicular to the intersection. The dihedral is 90 degrees minus one-half of this angle, as defined. (The dihedral of the two wings of a biplane may differ.

DIRIGIBLE:
An elongated form of balloon provided with propelling system, rudders and stabilizing surfaces.
Non-rigid—A dirigible whose form is maintained by the pressure of the contained gases.
Rigid—A dirigible whose form is maintained by a structure within the envelope.
Semi-rigid—A dirigible whose form is maintained by a rigid keel and gas pressure.

DIVING RUDDER:
See Elevator.

DOPE:
Material, like varnish or lacquer, used to treat cloth surface of balloons and airplanes to maintain air tightness, increase strength and increase tautness. Usually dopes have a nitro-cellulose base.

DRAG:
The component parallel to the relative wind of the total force on an aircraft due to the wind through which it moves.
"*Wing resistance*" is that part of the drag due to the wings, (formerly called "drift.")
"*Parasitic resistance*" is that due to the rest of the plane, (formerly called "head resistance.")

DRIFT METER:
Instrument for measurement of angular deviation of aircraft from a set course.

ELEVATOR:
A hinged surface for controlling the longitudinal attitude of an aircraft.

Air Slang Glossary

Bumps—Uneven flying levels in the air caused by currents of air rising or falling.
Conke—To stall motor.
Contact—Signal called to indicate ignition switch is thrown and movement of propeller will start motor.
Crab—To drift with wind sideways.
Crack-up—To crash a plane without damage to pilot.
Crash—A serious accident.
Crate—Old style plane.
D. H.—The DeHaviland plane.
Flop—Unusual flying; or flying out of level.
Gun—The gas throttle.
Jazz Ride—Pleasure ride, generally with a few flops.

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EMPENNAGE:
See Tail.

ENTERING EDGE:
The foremost edge of an aerofoil or propeller.

ENVELOPE:
Portion of balloon containing the gas.

FINS:
Small fixed aerofoils attached to different parts of aircraft to promote stability. May be horizontal or vertical and are often adjustable, such as Tail fins, Skid fins, etc.

FLIGHT PATH:
The path of the center of gravity of an aircraft with reference to the earth.

FLOAT:
That portion of the landing gear of an aircraft which provides buoyancy when resting on water. Pontoon.

FUSELAGE:
See Body.

GAP:
The shortest distance between planes of the chords of the upper and lower wings of a biplane.

GLIDE:
To fly without power.

GLIDER:
A form of aircraft similar to an airplane but without motive power. Sometimes called soaring machine.

GUY:
Rope, chain, wire or rod attached to object to guide or steady it.

HANGAR:
Structure for housing airplane or balloon.

HELICOPTER:
A form of aircraft deriving its support by vertical thrust of the propellers.

HORN:
A short arm fastened to a movable part of an airplane, serving as a lever arm.

Air Slang Glossary

Jenny—A Curtis J N plane, used for training.
Job—The plane itself.
Prop—Propeller.
Revving—Warming up motor.
Roll—To turn plane over side wise.
Rubber Cow—Lighter than air craft.
Stick—The control, a steering handle, the movement of which controls both up and down and side movements of plane.
Tac—The tachometer, which shows the number of revolutions per minute the motor is making.
Taxi—To run plane over ground at the take off.
Zoom—Steep uphill climb and descent.

INCLINOMETER:
Instrument for measuring the angle made by any axis of an aircraft with the horizontal. Called a clinometer.

INSPECTION WINDOW:
A small transparent window in the envelope of a balloon or in the wing of an airplane.

KITE:
A form of aircraft without other propelling means than a towline pull. A kite's support is gained by the pressure of the wind moving past its surface.

LANDING GEAR:
The understructure of an aircraft designed to carry the load when running on or resting on surface of land or water.

LEADING EDGE:
See ENTERING EDGE.

LEEWAY:
The angular deviation from a set course, called drift, caused by cross currents of air.

LIFT:
The component perpendicular to the relative wind, in a vertical plane, of the force on an aerofoil due to the air pressure caused by motion through the air.

LIFT BRACING:
See STAY.

LOAD:
Dead—The structure, power plant and essential accessories of an aircraft.
Full—The maximum weight which an aircraft can support in flight.
Useful—The difference between dead weight and full weight.

LONGERON:
See LONGITUDINAL.

LONGITUDINAL:
A fore-and-aft member of the framing of an airplane body.

MONOPLANE:
A form of airplane whose main supporting surface is a single wing, extending equally on both sides of body.

NACELLE:
See BODY. (Applied to pusher type of airplane only.)

ORNITHOPTER:
A form of aircraft deriving its support and power from flapping wings.

PANEL:
The unit plane section of which the airplane is made.

PARACHUTE:
An apparatus, umbrella-like, used to retard descent of falling body.

PONTOONS:
See FLOAT.

PYLON:
Mast or pillar used as a course marker.

RACE:
Of propeller, see SLIP STREAM.

RELATIVE WIND:
The motion of the air with reference to a moving body. Its

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direction and velocity are found by adding the velocity of the air with reference to the earth and the velocity (equal and opposite to) of the body with reference to the earth.

RUDDER:
A hinged surface used for controlling the attitude of an aircraft about its vertical axis.
Rudder bar—the foot bar used to operate the rudder.

SEAPLANE:
The form of air plane in which the landing gear is suitable for operation from the water.

SIDE-SLIPPING:
Sliding downward and inward when making a turn, due to excessive banking. The opposite of skidding.

SKIDDING:
Sliding sideways away from the center of the turn; due to insufficient banking. The opposite of side-slipping.

SKIDS:
Runners designed to prevent nosing of land machine when landing, or to prevent dropping into holes in rough ground.

SLIP STREAM:
The stream of air driven aft by the propeller with a velocity relative to the plane greater than the surrounding body of air.

SPREAD:
The maximum distance laterally from tip to tip of an airplane wing.

STABILITY:
The quality of an aircraft in flight that causes it to return to a condition of equilibrium.
Directional—with reference to vertical axis.
Inherent—with reference to arrangement of its fixed parts.
Lateral—with reference to longitudinal axis.
Longitudinal—with reference to the lateral axis.

STABILIZER:
See FINS.
Mechanical—Automatic device to secure stability.

STAGGER:
The advance of the entering edge of the upper wing of a biplane over that of the lower. May be positive or negative.

STALLING:
The condition of an airplane which has lost the speed necessary to remain in flight and under control.

STATOSCOPE:
Instrument used, chiefly in ballooning, for detecting small rates of ascent or descent.

STAY:
Wire, rope, rod, etc., used to hold parts together or to contribute stiffness.

STEP:
A break in the form of the bottom of a float.

STREAMLINE FLOW:
Term used to describe the condition of continuous flow of a fluid. Opposed to eddying flow which is discontinuous.

STREAMLINE SHAPE:
A shape designed to prevent eddying flow, and to preserve streamline flow. A shape which keeps resistance at the minimum.

STRUT:
A compression member of a truss frame. The vertical members of the wing trusses of a biplane are struts.

SWEEP BACK:
The horizontal angle between the lateral axis of an airplane and the entering wedge of the main plane.

TAIL:
The rear portion of an aircraft to which are attached the rudder, elevators and fins.

THRUST DEDUCTION:
The reduction of pressure under the stern of an aircraft due to propeller influence. This reduces the propulsive power of the propeller.

TRAILING EDGE:
The rear edge of an aerofoil.

TRIPLANE:
A form of airplane with three supporting surfaces, one above the other.

TRUSS:
The frame by which the wing loads are transmitted to the body. Trusses are composed of struts, stays and spars.

VELOMOTER:
See AIR speed meter and anemometer.

VOL-PIQUE:
A nose dive.

VOLPLANE:
See GLIDE.

WAKE GAIN:
The effect produced by the forward movement of the fluid surrounding a moving vessel. This forward movement, in the case of an airplane, of the air surrounding the skin of the aircraft has two results: It reduces the resistance of the hull and also reduces the advance of the propeller, reducing the power of the latter.

WARP:
To change the form of the wing by twisting.

WING:
The main supporting surfaces of an airplane.

WING RIB:
Fore-an-aft members of the wing structure.

WING SPAR:
Athwartship member of the wing structure resisting tension and compression.

YAW:
To swing off course about the vertical axis.
Angle of—Angular deviation from course of the fore-an-aft axis.

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Some Naval Requirements

At a meeting of the Los Angeles section of the Society of Aeronautical Engineers, Lieut.-Comdr. L. B. Richardson, of the United States Navy, gave a summary of the requirements of aircraft for naval use.

In addition to flying and climbing at a fast rate of speed the navy plane must be able to carry large and heavy ordnance loads. It has to be light structurally, but strong enough to withstand heavy seas, both when taking off, landing, and when moored at buoys. It must have ample space for the crew and be reinforced so that mechanics can climb all over it. Due attention must be paid to providing protection for the crew in case of crashing.

It should be so designed that it can turn in a short radius; go into a tail spin easily and come out of it of its own accord. The plane must have sufficient stability so that it can be flown with hands off the controls and yet it must answer to these controls instantly.

A plane suitable for navy use must carry parachute flares, landing lights, smoke bombs, emergency rations, anchor and line, engine tools and spares. If a bomber it should have all instruments for discharging bombs accessible in a protected cockpit.

In order to permit of storage on board airplane carrier ships the wings have to be of the folding type, but so designed that the plane can be rigged for flight in three minutes. The wing spread, ready for flight, cannot exceed the available dimensions of the elevators used on the airplane carrier ships.

The engine must come within the weight limitation of a pound and three-quarters per horse power. It has to be strong enough to run for 300 hours between each overhaul. If water cooled the radiator must be light, but leakproof, and situated where it neither interferes with vision nor causes additional air resistance.

Fuel tanks have to be light, and of a material that is not affected by either benzol or ethyl types of fuel. The hull must be of non-corrosive metal, or of material that will not soak up water even if anchored for an entire season.

Propellers have to be thin enough to be light and efficient and yet must be of such material that they withstand spray and rain. Adjustable-pitch propellers are being made the subject of exhaustive experiments so that a combination of an adjustable propeller and engine with supercharger can be adopted for the sake of efficiency.

The navy's requirements in plane design and construction have always been rigid, and not always easy to meet; but the effect of the attitude of the Government has been to spur the designers and manufacturers to greater efforts.

The constant work of the navy engineers in co-operation with the technical staffs of privately owned manufacturers was responsible in large measure for the production of a successful air-cooled engine that would not heat when run on a lean mixture.

The New Navy Bomber built by Glenn Martin for the United States Navy.

Air Commerce Rules

A small pamphlet, "Air Commerce Regulations," is now available on request to the new Aeronautics Branch of the United States Department of Commerce, Washington, D. C.

This new department has the important function of air regulation, which includes traffic rules.

The booklet covers the licensing of aircraft, marking, operating, the licensing of pilots and mechanics and all the air traffic rules.

The duties of this department and the responsibility for the enforcement of the rules and regulations are on the shoulders of Assistant Secretary William P. McCracken, Jr., and Clarence M. Young, Chief of the Air Regulations Division.

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